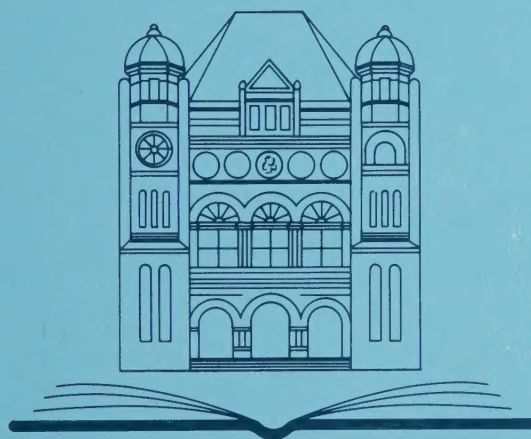


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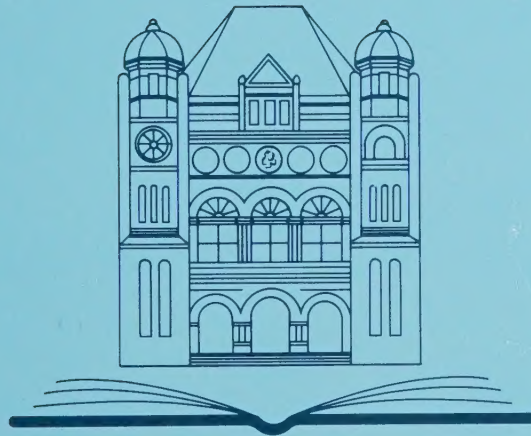


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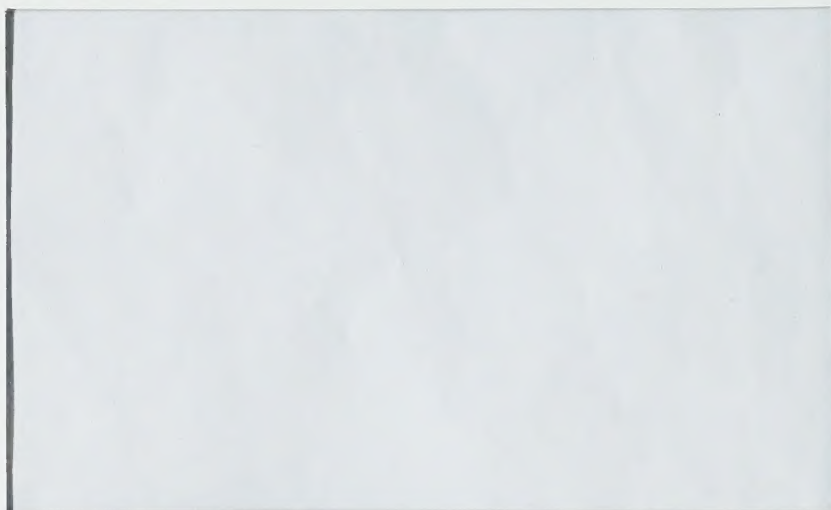
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March 1995




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INTRODUCTION

Once, years of study in musty classrooms were necessary to obtain even a dim, incoherent knowledge of science. Today, all that has changed! Thanks to the efforts of media, bureaucrats and environmental interest groups, a dim, incoherent knowledge of science is available to anyone.¹

While there is no shortage of discussion and opinion on environmental matters, it is often difficult to understand the technical background to such issues, and to develop the knowledge and confidence to assess independently the information provided by the media, pressure groups and government. The annotated references included in this paper are intended to provide objective basic information on science and the environment, rather than to promote positions on issues. That is not to say that opinions, and indeed biases, are entirely absent. Rather, these sources emphasize information and general principles to help the reader develop reasoned responses to the many environmental challenges facing Ontario and the world. For the most part, the citations included are those that have served me well over the years. I have also drawn upon an excellent critical review by noted ecologist, Robert L. Smith, to identify some of the better text books in ecology and environmental science.² In a very few cases, when they looked particularly interesting and relevant, I have listed items from book reviews in *New Scientist* or *Nature* magazines.

The books and review papers discussed below vary in technical depth, but they should all be understandable to the nonspecialist with an interest in the environment. While certain passages or calculations may appear intimidating, the main discussions tend to be clear and straightforward. In some cases, issues are complex and difficult, but they must be understood if effective policies are to be developed and implemented.

¹ Paraphrase of Tom Weller, *Science Made Stupid: How to Discomprehend the World Around Us* (Boston: Houghton Mifflin Company, 1985), p. 7.

² Robert L. Smith, "Ecology and environmental science books: a critical review," *Choice* 23 (February 1986): 829-839.

This paper is divided into a series of subjects. For each, I have provided a selection of core references, usually with brief annotation. When MPPs, their staff assistants or interested constituents require background information on an environmental issue, these sources should provide a useful starting point. Most of the references listed are in the collection of the Legislative Library at Queen's Park. Should additional environmental information be required, the Reference Unit of the Legislative Library can identify and obtain a broad range of published and unpublished sources. The Legislative Research Service (LRS) can provide detailed analysis of environmental, scientific, and natural resource issues for MPPs and Legislative Committees. Further LRS publications on environmental topics are listed in the Appendix.

I welcome suggestions from readers for additional items to enhance future editions of this bibliography.

ELEVEN RECOMMENDATIONS

The following titles strike me as having something special to offer to anyone with a developing interest in the environment, and in the scientific means used to describe and understand it. Some are classics, while others are merely provocative.

Barnett, Arnold. "How Numbers Can Trick You." *Technology Review* (October 1994): 38-45.

Brennan, R.P. *Levitating Trains and Kamikaze Genes: Technological Literacy for the 1990s*. New York: Wiley, 1990.

Easterbrook, Gregg. "Everything You Know about the Environment is Wrong: A Liberal Sceptic's Guide to Earth Day." *The New Republic* (30 April 1990): 14-27.

Gallagher, Charlette R. and John B. Allred. *Taking the Fear Out of Eating: A Nutritionists' Guide to Sensible Food Choices*. Cambridge: Cambridge University Press, 1992.

Golley, F.B. *A History of the Ecosystem Concept in Ecology*. New Haven, CT: Yale University Press, 1994.

Leopold, Aldo. *"A Sand County Almanac and Sketches Here and There*. New York: Oxford University Press, 1949 (Commemorative Edition, 1987).

McHarg, Ian L. *Design With Nature*. Garden City, NY: Natural History Press, 1969.

Odum, E.P. *Fundamentals of Ecology*. 3rd ed. Philadelphia, PA: W.B. Saunders, 1971.

Watt, K.E.F. *Principles of Environmental Science*. New York: McGraw-Hill, 1973.

Weller, Tom. *Science Made Stupid: How to Discomprehend the World around Us*. Boston, MA: Houghton Mifflin Company, 1985.

Williams, Steven. *Fantastic Archeology: The Wild Side of North American Prehistory*. Philadelphia, PA: University of Pennsylvania Press, 1991.

ARTICLES & BOOKS

Acid Precipitation

(See Also: Air Quality)

Cowell, D.W. *Assessment of Aquatic and Terrestrial Acid Precipitation Sensitivities for Ontario*. APIOS Report No. 009/86, Air Resources Branch, Ontario Ministry of the Environment. Toronto: The Ministry, 1986.

- *Maps and explanatory text outlining ecosystem sensitivities to acid deposition.*

Kelso, J.R.M., et al. *Acidification of Surface Waters in Eastern Canada and its Relationship to Aquatic Biota*. Canadian Special Publication of Fisheries and Aquatic Sciences, No. 87. Ottawa: Department of Fisheries and Oceans, 1986.

- *Good analysis and overview of the factors affecting sensitivity of lakes and rivers to acidification.*

Mohner, Volker A. "The Challenge of Acid Rain." *Scientific American* 259:2 (August 1988): 32-38.

- *An excellent overview of the science and issues.*

Pearce, Fred. "Whatever Happened to Acid Rain?" *New Scientist* 1734 (15 September 1990): 57-60.

- *Is acid rain yesterday's problem? Pearce does not think so, and warns of the concerns associated with diverting research funds to the trendy new issues of the day when serious problems remain to be solved. Although British in focus, much Canadian research is cited to make his case.*

Schindler, D.W. "Effects of Acid Rain on Freshwater Ecosystems." *Science* 329:4836 (8 January 1988): 149-157.

Gunn, J. and W. Keller. "Biological Recovery of Acid Lakes after Reduction in Emissions of Sulphur." *Nature* 345 (1990): 431-433.

Neary, B. and P.J. Dillon. "Effects of Sulphur Deposition on Lake Water Chemistry in Ontario, Canada." *Nature* 333 (1988): 340-343.

- *Three excellent reviews by Canadian scientists in major international journals.*

Tomlinson, G.H. and F.L. Tomlinson, eds. *Effects of Acid Deposition on the Forests of Europe and North America*. Boca Raton, FL: CRC Press, 1990.

- *A strong analysis of air pollution factors affecting forest decline.*

Agriculture

Adams, Norman. "The Case Against Organic Farming." *New Scientist* 127:1734 (15 September 1990): 68.

- *A critical look at the relative productivity of "organic" and conventional farming practices in terms of water quality, wildlife habitat and fuel management.*

The Environmental Applications Group Limited. *The Effects of Agricultural Land Use on Wetlands in Southern Ontario*. Soil and Water Management Branch, Ontario Ministry of Agriculture and Food. Toronto: The Ministry, 1987.

- *Provides an overview of wetland types, drainage characteristics of agricultural land, buffer zones and instream processes, and comparative sensitivity of various types of wetland ecosystems to agricultural land use practices.*

Kendall, Ronald J. "Farming with Agrochemicals: The Response of Wildlife." *Environmental Science and Technology* 26:2 (1992): 239-245.

- *A thorough review of how direct and indirect effects of agrochemicals on wildlife can be effectively used in risk assessment and regulation.*

Lockeretz, W., ed. *Environmentally Sound Agriculture*. New York: Praeger, 1983.

- *An uneven collection of conference papers emphasizing organic agriculture, pest management and conservation farming systems. Several articles are interesting but most tend to be quite narrow in scope.*

Ontario Energy and Agricultural Policy Committee. *Energy and Agriculture, Vol. I, Summary and Recommendations*. Toronto: The Committee, 1981.

Ontario Energy and Agricultural Policy Committee. *Energy and Agriculture, Vol. II, Summary of Research Findings*. Toronto: The Committee, 1982.

- *Now somewhat out of date, these reports describe energy supplies and uses related to Ontario agricultural activities and outline a proposed agricultural energy strategy for the province. A great deal of interesting and detailed material is presented, and it might be worthwhile for the departments concerned to consider a revision to take into account changes in the last decade.*

Pimentel, David, ed. *Handbook of Energy Utilization in Agriculture*. Boca Raton, FL: CRC Press, 1980.

- *An extremely useful piece of work, also unfortunately aging rapidly, that describes energy inputs and outputs for field crops, vegetables, fruits and tree crops, livestock production and forestry.*

Pimental, D., T. Culliney, I. Buttler, D. Reinemann and K. Beckman. "Low-Impact Sustainable Agriculture Using Ecological and Management Practices," *Agriculture, Ecosystems and Environment* 27 (1989): 3-24.

- *Discusses adapting agricultural systems to regional environments and optimizing the use of biological and chemical/physical resources in the agroecosystem.*

Polprasert, C. *Organic Waste Recycling*. Chichester, UK: Wiley, 1989.

- *Includes good sections on composting and land treatment of waste water and sludge.*

Reganold, J.P., R. Papendick and J. Parr. "Sustainable Agriculture." *Scientific American* 262:6 (June 1990): 112-120.

- *Discussion of benefits of traditional "conservation-minded" farming methods, emphasizing maintenance of soil productivity.*

Reganold, J.P., *et al.* "Soil Quality and Financial Performance of Biodynamic and Conventional Farms in New Zealand." *Science* 260 (16 April 1993): 344-349.

- *Comparisons of soil quality under alternative farming practices.*

Troeh, F.R., J. Hobbs and R. Donahue. *Soil and Water Conservation for Productivity and Environmental Protection*. Englewood Cliffs, NJ: Prentice-Hall, 1980.

- *Good sections on soil erosion, cropping systems, tillage practices and pasture/range/forest management related to environmental conservation. Includes a discussion of the economics of soil conservation.*

Zilberman, David, *et al.* "The Economics of Pesticide Use and Regulation." *Science* 253 (2 August 1991): 518-522.

- *An evaluation of policy options which takes into account agricultural productivity gains and environmental and health concerns. Pesticide-use fees are proposed as being more efficient than outright pesticide bans as a mechanism to achieve environmental goals.*

Air Quality

(See Also: Acid Precipitation; Climate Change; Ozone Depletion)

Bates, David V. "Danger Signs for Health from Acid Air Pollution." *Canadian Speeches* 2:10 (February 1989): 9-17.

- *Review of health effects, particularly respiratory ailments, due to oxides of nitrogen, ground-level ozone and other gaseous combustion products. A public health perspective.*

Bevan, Michael, *et al.* "Exposure to Carbon Monoxide, Respirable Suspended Particulates, and Volatile Organic Compounds while Commuting by Bicycle." *Environmental Science and Technology* 25:4 (1991): 788-791.

- *Exposure to these automobile emissions was found to be higher for commuting cyclists than for stationary exposures in a busy street and on common parkland. The combination of increased breathing rate and high exhaust levels results in increased exposure.*

Bodansky, D., M. Robkin and D. Stadler, eds. *Indoor Radon and its Hazards*. Seattle, WA: University of Washington Press, 1987.

Committee on Health Effects of Exposure to Radon (BEIR VI). *Health Effects of Radon: Time for Reassessment?* Washington, DC: National Academy Press, 1994.

Peto, J. and S. Darby. "Radon Risk Reassessed." *Nature* 368 (10 March 1994): 97-98.

"Radon: The Problem No One Wants to Face." *Consumer Reports* 54:10 (October 1989): 623-625.

Stevenson, D. "The Risks of Radon." *Canadian Consumer* 20:2 (1990): 39-44.

- *Two technical books and a research review, along with two popular articles that provide sound background on the dangers posed by radon gas in homes and other buildings, along with information on monitoring and remedial measures. Radon appears to be responsible for about 55% of the average person's radiation exposure and may represent the greatest environmental health risk most Ontario residents currently face; yet the issue appears to have a remarkably low public profile and policy priority!*

Chang, T.Y., R.H. Hammerle, S.M. Japar and I.T. Salmeen. "Alternative Transportation Fuels and Air Quality." *Environmental Science and Technology* 25:7 (1991): 1190-1197.

- *A comprehensive discussion of the potential air quality benefits of reformulated gasoline, methanol, ethanol and other alternative automobile fuels.*

Dann, T. *Canadian Urban Monitoring Programs for O₃, NO_x and VOC*. Pollution Measurement Division, C&P, Environment Canada, Rep. No. PMD 89-2. Ottawa: The Division, February 1989.

- *A concise summary of air pollution in urban (and rural) areas in Ontario and Canada. Pollutants discussed include ozone, oxides of nitrogen, and volatile organic compounds. Much important information in a manageable package for those interested in current trends in air quality.*

Davies, Anton. "Storm Clouds on the Horizon." *Hazardous Materials Management* (October 1994): 37-39.

- *A review of air quality regulatory initiatives across Canada.*

Goodall, Alan. "Motor Vehicles and Air Pollution." *Canadian Social Trends* 24 (Spring 1992): 21-26. (Statistics Canada 11-888E)

- *A good, general overview of vehicular pollution with a review of Canadian and American regulatory initiatives.*

Holsen, Thomas M., *et al.* "Dry Deposition of Polychlorinated Biphenyls in Urban Areas." *Environmental Science and Technology* 25:6 (1991): 1075-1081.

- *A rather technical article but with important findings: polychlorinated biphenyl (PCB) fluxes and airborne concentrations are much higher in urban than in non-urban areas, so that cities near the Great Lakes must be considered major sources for deposition of airborne PCBs into lakes.*

Ontario, Ministry of the Environment, Air Resources Branch. *Air Quality in Ontario, 1990*. Report and Appendix. Toronto: Queen's Printer for Ontario, 1992.

- *Statistical summary of provincial air quality monitoring results with a minimum of interpretation. (Revised annually)*

Kolomeychuk, R.J., K.L. Yeager, J. Spiegel and A. Yassi. *Effects of Automotive Emissions*. Presented at 77th Ann. Mtg., Air Pollution Control Association, San Francisco, CA, 24-29 June 1984. Toronto: The Environmental Applications Group Limited, 1984.

- *A summary of studies done for the Environmental Protection Service of Environment Canada looking at effects on health, terrestrial ecosystems (particularly crop damage), aquatic ecosystems, man-made materials and smog by automotive exhaust emissions.*

Latham, Todd. "Ontario's Clean Air Program." *Hazardous Materials Management* (April 1991): 56-58.

- *A review of the Ministry of the Environment's initiatives prior to the last provincial election toward revising Regulation 308, which governs emissions of air pollutants in the province.*

Lave, L.B., *et al.* "Controlling Emissions from Motor Vehicles: A Benefit-Cost Analysis of Vehicle Emission Control Alternatives." *Environmental Science and Technology* 24:8 (1990): 1128-1135.

- *Hydrocarbon emissions from vehicles are major contributors to a number of air pollution problems. Losses during refuelling and evaporative emissions from cars and trucks are a significant component of hydrocarbon pollution. This paper examines this relatively unknown aspect of vehicle pollution and details the cost implications of alternative control strategies.*

Lioy, Paul J. "Assessing Human Exposure to Airborne Pollutants: Advances and Opportunities." *Environmental Science and Technology* 25:8 (1991): 1360-1362.

- *An overview of an important pathway by which humans are exposed to toxic chemicals.*

Lippmann, Morton. "Health Effects of Tropospheric Ozone." *Environmental Science and Technology* 25:12 (1991): 1954-1962.

- *The acute health effects of ground-level ozone in the population at large are reductions in lung function and increases in respiratory symptoms and inflammation. An important overview of emission sources, exposures, health effects and regulatory implications.*

Marshall, P.G. "Asbestos: Are the Risks Acceptable?" *Editorial Research Reports* 1:9 (March 1990): 126-139.

- *A good review of recent research on the risks and policy initiatives associated with asbestos as a respiratory health hazard.*

Milko, R.J. *Indoor Air Quality*. Background Paper for Parliamentarians No. BP133-E. Ottawa: Research Branch, Library of Parliament, 1985.

- *A useful although slightly dated overview of radon, asbestos, tobacco smoke, formaldehyde, combustion products, organic chemicals and airborne micro-organisms and allergens in the home and workplace.*

Ontario, Legislative Assembly. Standing Committee on General Government. *Acid Rain Abatement Programs*. Toronto: The Committee, 1989.

- *This Legislative Committee reviewed the progress of Ontario Hydro and the metallurgical sector in meeting provincial regulations designed to curb emissions of acid gases from major air pollution sources. The Committee's conclusions and recommendations on the future regulation of sources contributing to acid precipitation are also presented.*

Ontario, Ministry of the Environment. *CAP: Clean Air Program — Draft Regulation Overview*. Toronto: The Ministry, August 1990.

- *This report, along with 11 Appendices and a summary of comments received on a 1987 discussion paper, present the Ministry's proposals for regulating stationary air emission sources in Ontario. Readers interested in air pollution management and regulation should review these discussion papers.*

Stern, A., et al. *Fundamentals of Air Pollution*. 2nd ed. New York: Academic Press, 1984.

- *A basic text on the various types of air pollution, along with information about their transport and impacts. In addition to providing a brief overview of atmospheric processes affecting the distribution and fate of pollutants, basic principles of air monitoring and emission controls are described. A useful introduction for the nonspecialist.*

Biodiversity/Extinction

(See Also: Ecology & Ecosystems, Business/Economics/Sustainable Development, Natural History, Population and Poverty)

Biodiversity is a term used to describe the variety of individuals, species and populations of plants and animals which make up the world's living resources: its ecosystems. It is a matter of rising concern that species are becoming extinct at an increasing rate due to the development of lands and waters, often as a direct result of population growth. This trend carries practical costs, including a reduction in the

aesthetic quality of the world, missed economic opportunities, and loss of the important role certain ecosystems play in atmosphere and climate moderation.

The articles which follow discuss these issues in a generally balanced and objective fashion. The entire May 1992 issue of the journal *Ambio* was devoted to various aspects of biodiversity, and is a good starting point for readers interested in these issues.

Erlich, P.R. and Edward O. Wilson. "Biodiversity Studies: Science and Policy." *Science* 253 (16 August 1991): 758-762.

Gee, Henry. "The Objective Case for Conservation." *Nature* 357 (25 June 1992): 639.

Koshland, Daniel. "Preserving Biodiversity." *Science* 253 (16 August 1991): 717.

Mann, Charles C. "Extinction: Are Ecologists Crying Wolf?" *Science* 253 (16 August 1991): 736-738.

Randall, Alan. "The Value of Biodiversity." *Ambio* 20:2 (April 1991): 64-68.

Business/Economics/Sustainable Development

(See Also: Agriculture, Biodiversity/Extinction, Goods and Services, Public Policy, Population and Poverty)

Aiken, W.R.O. "Conserving the Environment: Sustaining Economic Growth." *Canadian Business Review* (Summer 1989): 17-20.

_____. *The Environment and the Economy*. Kingston, ON: Centre for Resource Studies, Queen's University, June 1988.

- *Two thoughtful articles by the Executive Vice-President of Inco Ltd. and the Vice Chairman of the National Task Force on Environment and Economy.*

D'Aquino, T. "The Business of the Environment." *Policy Options* (March 1990): 3-6.

- *The President and CEO of the Business Council on National Issues discusses the business advantages of improved environmental management.*

Beaumont, John R. "Managing the Environment: Business Opportunity and Responsibility." *Futures* (April 1992): 187-205.

- *The author notes that few business organizations are acting on the strategic level related to environmental matters. He argues that business has both a responsibility and an opportunity to assist in environmental management, and that business actions should become proactive rather than reactive in this respect. Discussion centres around business functions — accounting and finance, information systems, production, marketing, and organizational structure and culture.*

Canada. National Task Force on Environment and Economy (G. Lecuyer, Chair). *Report*. Ottawa: The Task Force, 1987.

Canadian Institute of Chartered Accountants. *Audit of Financial Statements Affected by Environmental Matters*. Toronto: The Institute, 1994.

- *an attempt to set standards for the practice of environmental accounting and auditing.*

Chivan, Eric. "The Ultimate Preventive Medicine." *Technology Review* (November/December 1994): 34-40.

- *A discussion of the human health implications of global environmental problems and the lack of political interest in these potentially enormous social impacts.*

Crittenden, Guy. "Environmental Site Assessment: Lenders and Industry Cope With New Standards and Property Risks." *Hazardous Materials Management* (October 1994): 18-24.

- *A review of the regulatory and financial environments affecting real estate, site investigations and lender relations.*

Dixon, John A. and Paul B. Sherman. "Economics of Protected Areas." *Ambio* 20:2 (April 1991): 68-74.

- *This article provides an economic viewpoint on costs and benefits associated with protected natural areas, giving quantitative and qualitative examples. A common failure of conventional economic analysis is that benefits to society from protected areas are often underestimated, and the immediate costs of protection appear large by comparison.*

Doran, Lee. "Business Can Deliver Our Environmental Goals." *Canadian Speeches/ISSUES* (December 1990): 55-61.

- *A speech to the Certified General Accountants Association of Ontario which addresses ways in which business can meet society's expectations for real environmental accomplishments.*

58th Annual Couchiching Conference. *What on Earth Are We Doing? A Conference on the Environment*. Toronto: Couchiching Institute of Public Affairs, August 1989.

- *One of the best sources of information on business, sustainable development and the environment.*

Hayes, Dennis. "Harnessing Market Forces to Protect the Earth." *Issues in Science and Technology* (Winter 1990-91): 46-51.

- *A review of programs in several countries designed to identify "environmentally-friendly" products to consumers. Canada's Environmental Choice labelling program is discussed along with examples in the U.S.A., Japan, Germany and elsewhere.*

Kierans, T. *The Environment and the Economy: Getting it Right*. Ottawa: C.D. Howe Institute, 1990.

Managing Planet Earth: Readings from Scientific American. San Francisco, CA: Freeman, 1990.

- *Essentially a reprint of the September 1989 special issue of Scientific American which has strong summary articles on climate change, population growth, sustainable development and other issues. The first chapter is especially good, relating the technical and political needs to better manage the earth's resources.*

Mungall, C. and E.J. McLaren, eds. *Planet under Stress: The Challenge of Global Change*. Royal Society of Canada. Toronto: Oxford University Press, 1990.

- *A somewhat spotty collection of review articles on terrestrial, freshwater and marine ecosystems and the atmosphere. Largely prepared by Canadian authors, this book contains a great deal of information on diverse aspects of human utilization of natural resources. The book is largely concise and, for the most part, readable, and it provides a useful summary of most of the global environmental policy issues facing Canadians. It is weakest when it becomes philosophical and verbose, and when public policy considerations are being discussed.*

Odum, Howard T. *Environment, Power and Society*. New York: Wiley, 1971.

- *Twenty years ago, Odum examined sustainable development in terms of economics and energy flow, but nobody was interested at the time. Everyone should read this attempt to use energy analysis to help explain many complex systems of nature and human development. The systems analysis approach may initially seem disconcerting, but there is real insight in this book that should become a part of political analysis. Wait until you see inflation and recession explained in terms of ecological energy flow!*

Ontario, Ministry of Environment and Energy. *Pollution Prevention Planning: Guidance Document and Workbook*. Toronto: The Ministry, 1993.

- *An attempt by the provincial government to outline a step-by-step approach to the initiation and development of industrial pollution prevention planning programmes. A greater use of plain English would make it more user-friendly.*

Regens, James L. "Measuring Environmental Benefits with Contingent Markets." *Public Administration Review* 51:4 (July/August 1991): 345-352.

- *A proposed method for measuring the potential economic benefits of alternative environmental protection efforts.*

Schulhof, Michael. "Why Business Needs Scientists." *Scientific American* (November 1992): 138.

- *An essay by the vice-chairman of Sony USA and president of Sony Software who argues that the strong work ethic, intellectual curiosity and tenacity that characterize good scientists are qualities that produce creative risk-takers, much needed at the senior management level of innovative successful corporations.*

"Science in Canada." *Nature* 333:6175 (23 June 1988): 717-736.

- *An extensive look at Canadian science and scientists in the noted British journal Nature. Leading Canadian scientists and science managers were interviewed and many challenging comments were reported. An important series of articles for Canadians interested in the environment.*

Simunic, D. "Green Accounting: Industry Impetus for Fad is Based More on Finances than Altruism." *Environment Policy & Law* 5:7 (October 1994): 98.

- *Discussion of the usefulness of trying to set standards in the practice of environmental accounting and auditing at this time.*

Society of Management Accountants of Canada. *Accounting For the Environment*. Management Accounting Issues Paper 1. Hamilton, Ontario: The Society, 1992.

- *This paper identifies some of the key accounting issues related to the environment and offers some guidelines for improving environmental accountability. It also addresses the role of the management accountant in developing an environmental agenda for the organization and designing the appropriate performance measures to monitor its implementation.*

Stroup, R.L. and J.A. Baden. *Natural Resources: Bureaucratic Myths and Environmental Management*. Pacific Institute for Public Policy Research. New York: Ballinger Press, 1983.

- *A detailed study of natural resource development and economics with emphasis on the shortcomings of public sector administration of forests and water resources. Good analyses of property rights; native people as resource managers; resource management in bureaucratic settings; and regulation, incentives and pollution.*

Tisdell, C.A. "Environmental Conservation: Economics, Ecology and Ethics." *Environmental Conservation* 16:2 (Summer 1989): 107-112, 162.

- *An interesting essay on the reasons economists have been slow to take an interest in biological resources and their conservation.*

Tobias, Dave and Robert Mendelsohn. "Valuing Ecotourism in a Tropical Rain-Forest Reserve." *Ambio* 20:2 (April 1991): 91-93.

- *An example of an economic valuation of foreign and domestic tourism to the Costa Rican tropical rain forest. A good demonstration of how factors which were formally dismissed as intangibles or externalities are now successfully being incorporated into economic analyses.*

Turner, Kerry. "Economics and Wetland Management." *Ambio* 20:2 (April 1991): 59-63.

- *Another article discussing economic evaluation of resource values in the absence of conventional markets, with a focus on monetary valuation methods for wetland areas.*

Winter, G. *Business and the Environment*. New York: McGraw-Hill, 1988.

- *Perhaps the best of the practical handbooks of "industrial ecology".*

World Commission on Environment and Development. *Our Common Future*. Oxford: Oxford University Press, April 1987.

- *The famous "Brundtland Report" which popularized the sustainable development theme in the late 1980s.*

Climate Change

(See Also: Air Quality, Ozone Depletion, Energy)

The following review articles provide clear and concise discussions of the major scientific issues and controversies surrounding the issue of global warming, often referred to as the "Greenhouse Effect." All are written by highly respected scientists, ranging from the somewhat sceptical and cautious position of Richard Lindzen to the more urgent approach adopted by Stephen Schneider, Philip Jones and others. Whether global warming is yet measurable and what the rate of warming will be in the future are issues where much scientific uncertainty still remains. The following authors are reliable names to look for as new information becomes available:

Houghton, John. *Global Warming: The Complete Briefing*. Oxford: Lion Publishing, 1994.

Houghton, Richard A. and George M. Woodwell. "Global Climatic Change." *Scientific American* 260:4 (April 1989): 36-44.

Jones, P.D. and T.M.L. Wigley. "Global Warming Trends." *Scientific American* 263:2 (August 1990): 84-91.

Lindzen, Richard S. "Some Remarks on Global Warming." *Environmental Science and Technology* 24:4 (1990): 424-426.

Schneider, Stephen H. "Global Warming: Is it Real?" *Forum for Applied Research and Public Policy* (Winter 1989): 24-29. (NOTE: There are several other useful articles on policy implications of global warming in the Winter 1989 issue of *Forum*.)

_____. "The Global Warming Debate: Science or Politics?" *Environmental Science and Technology* 24:4 (1990): 432-435.

Warrick, Richard A. and Philip D. Jones. "The Greenhouse Effect: Impacts and Policies." *Forum for Applied Research and Public Policy* (Fall 1988): 48-62.

Other relevant papers include:

Ashmore, M. "The Greenhouse Gases." *Trends in Ecology & Evolution (TREE)* 5:9 (September 1990): 296-297.

- *A useful diagram explaining global energy cycles and the roles of carbon dioxide, methane, nitrous oxide, chlorofluorocarbons (CFCs) and other gases in potential global warming helps the reader make sense of an otherwise baffling array of information. This entire issue of TREE is devoted to scientific research on various aspects of global climate change.*

Beckerman, W. and J. Malkin. "How Much Does Global Warming Matter?" *Public Interest* 114 (Winter 1994): 3-16.

- *The authors argue that while melodramatic issues like global warming dominate public and political attention; concerns such as providing safe drinking water and public sanitation in developing countries, which are technically achievable and would have a huge and immediate benefit, are starved of funds and attention.*

Boehmer-Christianson, S.A. "A Scientific Agenda for Climate Policy?" *Nature* 372 (1 December 1994): 400.

- *An historical review of the responses of scientific organizations and politicians to the debates on global warming along with thoughts on likely future political trends in response to these challenges.*

Dowlatabadi, H., and M.G. Morgan. "Integrated Assessment of Climate Change." *Science* 259 (26 March 1993): 1813, 1932.

- *A review of current efforts to model the impacts of climate change and the effectiveness of alternative mitigating strategies.*

Emsley, John. "On Being a Bit Less Green." *New Scientist* 136 (17 October 1992): 53-54.

- *A concise, readable summary of what is now known about the various "greenhouse gases."*

Kerr, Richard. "Greenhouse Science Survives Sceptics." *Science* 256 (22 May 1992): 1138-1140.

- *An update of recent research findings including a useful discussion of uncertainties involved in predicting climate change.*

Moffat, Anne Simon. "Does Global Change Threaten the World Food Supply?" *Science* 256 (22 May 1992): 1140-1141.

- *A concise review of recent thinking on the potential impact of global warming on agricultural production. Balanced and readable.*

Nordhaus, W.D. "An Optimal Transition Path for Controlling Greenhouse Gases." *Science* 258 (20 November 1992): 1315-1319.

- *A somewhat technical article which describes recent efforts to model alternative strategies for reducing greenhouse gases. The 5 March 1993 issue of Science contains several letters from top scientists in this field who contribute to the discussions on Nordhaus' climate modelling.*

Pearce, Fred. "Not Warming but Cooling." *New Scientist* (9 July 1994): 37-41.

- *A review of the possible cooling influence of the "aerosol effect" and its potential interactions with greenhouse warming processes. Essentially, low clouds and layers of dust and pollution are blocking out the sun's heat, so that the atmosphere is simultaneously pulled in two different directions by powerful changes to its basic physics and chemistry. It is likely to show increasing signs of stress and unpredictability as a result.*

White, Robert M. "The Great Climate Debate." *Scientific American* 263:1 (July 1990): 36-43.

- *An important discussion of public policy implications of potential climate change, and the economic impacts of global warming and proposed control strategies.*

The following references relate largely to policy implications, particularly in Canada and Ontario.

Federal/Provincial/Territorial Task Force on Energy and the Environment. *Report on Reducing Greenhouse Gas Emissions*. Ottawa: The Task Force, August 1989.

- *A useful early look at greenhouse gas emissions, policy options available for Canada, and their potential consequences.*

Hengeveld, Henry. "The Global Warming Challenge: Understanding and Coping with Climate Change in Canada." *Environmental Science and Technology* 28:12 (1994): 519A-523A.

- *A recent overview of Canadian policies, research and initiatives by Environment Canada's science advisor on climate change.*

Ontario Legislative Assembly. Select Committee on Energy. *Interim Report on Climate Change*. Toronto: The Committee, 1990.

- *This all-party Legislative Committee heard evidence from international and Canadian experts and reported its interim conclusions. The Committee was unanimous in the opinion that creative leadership is needed now to prevent serious consequences of global warming from occurring in Ontario in the next century.*

Ontario. Ministry of Energy. *Global Warming: Towards a Strategy for Ontario*. Toronto: The Ministry, 1990.

- *A discussion paper released for public comment containing proposed remedial goals for Ontario.*

World Meteorological Organization. *Conference Proceedings: The Changing Atmosphere, Implications for Global Security*. MWO/OMM Report No. 710. Downsview, ON: Canadian Climate Centre, April 1989.

- *Proceedings of the "Toronto Conference" in 1988 which raised the profile of global warming as a security issue rather than as a scientific curiosity. Ozone depletion and long-range transport of air pollutants were also key topics discussed.*

The following articles provide thoughtful discussions of the economics, politics and equity issues associated with devising and implementing measures to limit global warming:

Grubb, M.J., D. Victor and C. Hope. "Pragmatics in the Greenhouse." *Nature* 354 (5 December 1991): 348-350.

Maddox, John. "The Greenhouse Question." *Nature* 345 (7 June 1990): 473.

Miller, Alan, I. Mintzer and P.G. Brown. "Rethinking the Economics of Global Warming." *Issues in Science and Technology* (Fall 1990): 70-73.

Stone, Richard. "Most Nations Miss the Mark on Emission-Control Plans." *Science* 266 (23 December 1994): 1939.

Swisher, J. and G. Masters. "A Mechanism to Reconcile Equity and Efficiency in Global Climate Protection: International Carbon Emission Offsets." *Ambio* 21:2 (April 1992): 154-159.

Ecology and Ecosystems

(See Also: Biodiversity/Extinction, Natural History)

Anderson, Stanley H. *Managing our Wildlife Resources*. New York: Charles Merrill, 1985.

- *Strong on the "people" aspects of wildlife management including: impacts and their mitigation; legislation and wildlife management; wildlife administration; goals and desires of the public, and management application of scientific research.*

Dasmann, Raymond. *Environmental Conservation*. 5th ed. New York: Wiley, 1984.

- *Broad international coverage of resource management and economic development.*

Good, R.E., D.F. Whigham and R.L. Simpson, eds. *Freshwater Wetlands: Ecological Processes and Management Potential*. New York: Academic Press, 1978.

- *Wetlands serve important functions as breeding, rearing and adult habitats for fish, birds, reptiles, amphibians and other creatures. They also support unusual or uncommon plant species and communities, and play important roles in modifying stream flows and maintaining water quality. In much of northern Ontario, peat bogs and other wetlands are a major factor controlling the hydrology of watercourses on the Canadian Shield. This collection has useful, if rather technical, descriptions of a broad range of wetland types and their biological characteristics. Perhaps of more interest to the general reader are chapters relating to marsh wildlife management, use of wetlands for water quality improvement, and recommendations for management of wetlands. This volume contains much pertinent information, but it does not achieve the same degree of synthesis and readability as some of the other books in this section.*

Golley, F.B. *A History of the Ecosystem Concept in Ecology*. New Haven, CT: Yale University Press, 1994.

- *An important review of ecosystem research, both successes and failures, from an insider's perspective.*

Gore, A.J.P., ed. *Mires: Swamp, Bog, Fen, and Moor*. Amsterdam: Elsevier Press, 1983.

- *A good survey of current knowledge on structure and function of peatlands. Such ecosystems dominate the topography of much of northern Ontario.*

Greeson, P.E., J.R. Clark and J.E. Clark., eds. *Wetlands Functions and Values: The State of Our Understanding*. Proceedings of the National Symposium, American Water Resources Association. Washington, DC: The Association, 1979.

- *Emphasis on an applied approach to wetlands and their ecological and economic values.*

Hynes, H.B.N. *The Ecology of Running Waters*. Toronto: University of Toronto Press, 1970.

Wetzel, R.G. *Limnology*. 2nd ed. San Diego, CA: Harcourt Brace Jovanovich, 1983.

- *These are among the best references describing the ecology of, respectively, rivers and lakes. The Hynes book in particular is comprehensive, easy to read and authoritative, and it carries its age extremely well. Plants, invertebrates and fish are all discussed in terms of interrelationships and their physical environments. The Wetzel volume describes the living communities in lakes, as well as the chemical and physical properties of water (such as nutrients, metals, light and heat) which affect aquatic life. While certain portions are rather technical for the average reader, most of the text is quite clear, if rather gothic in style. For anyone interested in how acid rain, water pollution, erosion, or changing flow characteristics can affect rivers and lakes, these two books provide excellent background.*

Lackey, R.T. and L.A. Nielson, eds. *Fisheries Management*. Oxford: Blackwells, 1980.

- *A good introduction to the characteristics of fisheries, principles of management and strategies for managing lakes, rivers and marine fisheries. A fine selection of international authors, including Canadians makes this a useful source of information for anyone developing an interest in natural resource management.*

Larcher, Walter. *Physiological Plant Ecology*. Trans. M.A. Biederman-Thorson. 2nd ed. Berlin: Springer-Verlag, 1980.

- *A concise, well-illustrated and easily understood introduction to plant responses to environmental conditions.*

Leopold, Aldo. *"A Sand County Almanac and Sketches Here and There*. New York: Oxford University Press, 1949 (Commemorative Edition, 1987).

- *A wonderful landmark in ecological thought and storytelling. Anyone with the slightest interest in nature, ecology or the environment should read this slim volume.*

Moen, A. *Wildlife Ecology: An Analytical Approach*. San Francisco, CA: W.H. Freeman, 1973.

- *A very good book describing the ways in which wildlife populations, particularly deer, interact with their habitats. A good reference for those pursuing an interest in natural resource management issues.*

Mueller-Dombois, D. and H. Ellenberg. *Aims and Methods of Vegetation Ecology*. New York: Wiley, 1974.

- *Comprehensive review of basic concepts, sampling techniques, vegetation-environment processes. While some sections may be of interest only to biologists, there is much to satisfy the general reader with an interest in terrestrial ecosystems, particularly vegetation communities.*

Odum, E.P. *Fundamentals of Ecology*. 3rd ed. Philadelphia, PA: W.B. Saunders, 1971.

- *A classic which clearly explains basic ecological concepts such as ecosystems, food chains and energy flow, and the way in which human activities and natural, physical, chemical and biological forces shape populations and communities of plants and animals. The basic ecology of freshwater, marine and terrestrial habitats are well explained. Most of this text has dated very little, and it should be considered a "must" for anyone who seriously wishes to understand and address environmental issues.*

_____. *Ecology and our Endangered Life Support Systems*. Sunderland, MA: Sinauer Associates, 1989.

- *This is in some ways a revision of Fundamentals of Ecology and is clear, concise and interesting, but greater emphasis is placed on attempting to reconcile economics and social realities with ecological science. The excellent Prologue and Epilogue are written in a non-technical style for the layman, and although the book draws very heavily on American sources, it is a thoughtful and enjoyable introduction to ecology for those in the political or business fields. Highly recommended!*

Sarokin, David and Jay Schulkin. "The Role of Pollution in Large-Scale Population Disturbances — Part I: Aquatic Populations." *Environmental Science and Technology* 26:8 (August 1992): 1476-1484.

_____. "The Role of Pollution in Large-Scale Population Disturbances — Part II: Terrestrial Populations." *Environmental Science and Technology* 26:9 (September 1992): 1694-1701.

- *Welcome examinations of significant changes in world fish and wildlife populations due to habitat disturbances and environmental contamination. Objective and eye-opening surveys.*

Shaw, James. *Introduction to Wildlife Management*. New York: McGraw-Hill, 1985.

- *Perhaps the best available introduction to the ecological and evolutionary aspects of wildlife ecology. Political, social and economic considerations are viewed against a sound scientific background.*

Smith, Robert L. *Ecology and Field Biology*. 3rd ed. New York: Harper and Row, 1980.

- *Another classic ecology text, this book has a strong ecosystem approach to both plant and animal ecology. Theoretical and applied ecology are thoroughly treated. A good complement to the E.P. Odum volumes.*

Southwick, C.H., ed. *Global Ecology*. Sunderland, MA: Sinauer Associates, 1985.

- *An excellent anthology of documents and articles relating to world environmental trends, air pollution, the future of forests, soil erosion and other major issues.*

Spurr, S. and B. Barnes. *Forest Ecology*. 3rd ed. New York: Wiley, 1980.

- *A good overview of the soil, climatic and biological factors affecting the distribution of forest types and productivity of forest ecosystems.*

World Resources Institute. *World Resources, 1992-93*. Oxford: Oxford University Press, 1992.

- *This report highlights the current state of world soils, forests, waters and habitats, including degradation resulting from poor agricultural and industrial practices.*

Watt, K.E.F. *Principles of Environmental Science*. New York: McGraw-Hill, 1973.

- *An overlooked classic by an ecologist who did much of his pioneering work in Ontario working for the Ministry of Natural Resources on fishery and forestry management problems. This book attempts to define a set of basic "principles" of environmental science which then can be used in a practical way to analyze issues and resource management needs. While the book has useful discussions of watershed, forest, lake and agricultural ecosystems, its strength may be in looking at more complex social issues from an objective ecological viewpoint. Anyone involved with today's AIDS issues should find stimulating Watt's examinations of the ecology of historic plague and influenza epidemics.*

Education

(See Also: Public Policy and Environmental Research, Natural History, Ecology and Ecosystems)

Alberts, B.M. "Scientists as Science Educators." *Issues in Science and Technology* (Spring 1994): 29-35.

- *The president of the National Academy of Sciences discusses how outreach by working scientists is needed to upgrade curricula in elementary and secondary schools.*

Alper, J. "Scientists Return to the Elementary School Classroom." *Science* 264 (6 May 1994): 768-769.

- *Examples of outreach between universities and public schools.*

Barnett, Arnold. "How Numbers Can Trick You." *Technology Review* (October 1994): 38-45.

- *Excellent examples describing the misuse of statistics when communicating scientific or technical information to the public. The most common types of errors are clearly illustrated.*

Beardsley, Tim. "Teaching Real Science." *Scientific American* 267 (October 1992): 98-108.

- *A serious analysis of international students' success in science education, and reforms needed in North American school systems. Diverse viewpoints are presented in a balanced fashion.*

Brennan, R.P. *Levitating Trains and Kamikaze Genes: Technological Literacy for the 1990s*. New York: Wiley, 1990.

- *Brennan takes numerous topical technical issues and explains them in clear and very readable terms. Included are chapters on biotechnology and genetic engineering; the greenhouse effect and ozone depletion; energy efficiency; toxic wastes and others. No teacher should be without a copy.*

Charlton, Bruce. "The Perils of Popular Science." *New Scientist* 127:1730 (18 August 1990): 36-40.

- *This article discusses the academic stigma faced by scientists who have made efforts to popularize science in the public arena, particularly on television. This reluctance by objective and knowledgeable experts to appear in the media may be a major barrier to public understanding of environmental issues.*

_____. "When Science Should be a Humanity." *New Scientist* 130 (25 May 1991): 54-55.

- *The author proposes teaching science broadly as a liberal study, worthy of consideration for its own sake. Like the other humanities — literature, fine art, music and so on — science is a branch of culture, rather than merely a prelude to specialization in scientific research, engineering or medicine. Charlton's essay encourages scientists and educators to do a much better job of seeing most of science in this light, and promoting science to a broader range of students and the public.*

Canada. Council of Ministers of Education. *Environment and Social Initiatives: A Review of Policy Developments in Environmental Education*. Report presented to the Centre for Educational Research and Innovation, United Nations Organization for Economic Co-operation and Development (OECD). Toronto: The Council, February 1990.

- *A summary of environmental education in Canada prepared by provincial ministries of education for an international conference. It discusses curricula, teacher training and availability of outside resources for teachers.*

Grinell, S. "Science Centres Come of Age." *Issues in Science and Technology* (Spring 1988): 70-75.

- *Facilities such as the Ontario Science Centre and Science North which involve visitors in science are becoming widespread. The challenge for these institutions will be to successfully update their presentations to take advantage of the rapidly evolving field of environmental management.*

Hackerman, Norman. "Science Education: Who Needs It?" *Science* 256 (10 April 1992): 157.

- *A concise and thoughtful essay by a prominent scientist and educator who argues that science education ignores the fact that although 99% of the population is not involved in science or engineering research, nor do they want to be, many are likely to be interested in the observables of nature and the best lay explanations of them. He suggests we must develop educational methods and materials which fan an interest in nature among non-science majors, without losing them in a sea of detailed state-of-the-art explanations.*

Ontario. Ministry of Education. *Science is Happening Here*. Toronto: The Ministry, 1988.

_____. *Science in the Primary and Junior Division — Curriculum Ideas for Teachers*. Toronto: The Ministry, 1983.

- *One of Ontario's Goals of Education (#12) is to "develop respect for the environment and a commitment to the wise use of resources." These*

documents outline the science and technology programs for primary/junior elementary schools.

- _____. *Curriculum Guidelines: Science, Intermediate and Senior Divisions, Part 1, Program Outline and Policy.* Toronto: The Ministry, 1987.
 - _____. *Curriculum Guidelines: Science, Intermediate and Senior Divisions, Part 3, Science, Grades 9 and 10, General Level.* Toronto: The Ministry, 1987.
 - _____. *Curriculum Guidelines: Science, Intermediate and Senior Divisions, Part 15, Science in Society, OAC.* Toronto: The Ministry, 1988.
 - *These titles describe the science, technology and environment components of the junior and senior high school curricula.*
- Powell, Jerry. "Reading, Writing and Recycling: A Catalogue of Education Materials." *Resources Recycling* (December 1990): 93-95.
- *A listing, for educators, of some of the more widely known teaching tools about recycling. It distinguishes between curriculum materials and other educational resources.*
- Smith, Robert L. "Ecology and Environmental Science Books: A Critical Review," *Choice* 23 (February 1986): 829-839.
- *An important review by a veteran of the ecology textbook wars of the 1960s and 1970s. Sound analyses of the major offerings in ecology, environmental science, environmental economics, natural resource management and biogeography.*
- Sosa, M. and S.M. Malcolm. *Science Books & Films' Best Books for Children, 1988-91.* Annapolis Junction, MD: American Academy for the Advancement of Science Clearing Center, 1992.
- *Reviews of recommended children's science books.*
- Tobias, Sheila. "Reforming Freshman Science." *Technology Review* (May/June 1992): 70-71.
- *The author argues that introductory university courses should be magnets for recruiting and maintaining science majors, not filters to discourage the "unfit".*
- Weller, Tom. *Science Made Stupid: How to Discomprehend the World around Us.* Boston, MA: Houghton Mifflin Company, 1985.
- *An invaluable antidote to the rest of the items in this bibliography. Sharp satire on popular science books and magazines. Includes "how-to" instructions*

for building a home nuclear reactor in a 32-gallon plastic trash can to heat your doghouse or fill a hot tub. Not to be missed!

Williams, Steven. *Fantastic Archeology: The Wild Side of North American Prehistory*. Philadelphia, PA: University of Pennsylvania Press, 1991.

- *A funny and thought-provoking book that leaves no standing stone unturned or hoax unscrutinized. Williams defines "fantastic archaeology" as "those alternative views of the past that use data and interpretations that will not stand close scrutiny." An enjoyable application of elementary scientific objectiveness to "pop" theories such as Viking settlements in Oklahoma and lost tribes of Israel in several North American locales. A must-read!*

Electromagnetic Fields: Health Effects

In recent years there have been conflicting and often speculative reports linking electromagnetic fields generated by household appliances, power transmission lines and electrical transformers to a variety of health effects, including cancers.

Pool, Robert. "Is there an EMF-Cancer Connection?" *Science* 249 (7 September 1990): 1096-1098.

_____. "Electromagnetic Fields: The Biological Evidence." *Science* 249 (21 September 1990): 1378-1381.

_____. "Flying Blind: The Making of EMF Policy." *Science* 250 (5 October 1990): 23-25.

Stone, Richard. "Polarized Debate: EMFs and Cancer." *Science* 258 (11 December 1992): 1724-1725.

- *These articles from the journal Science provide the best introduction to the biological and policy aspects of these issues.*

Glazer, Sarah. "Electromagnetic Fields: Are They Dangerous?" *Editorial Research Reports* 16 (26 April 1991): 238-250.

Hester, Gordon L. "Electric and Magnetic Fields: Managing an Uncertain Risk." *Environment* 34:1 (January/February 1992): 7-32.

- *Two comprehensive and relatively balanced reviews of what is known about possible risks from electromagnetic fields generated by household wiring and appliances, power transmission lines, transformers, etc.*

Energy

(See also: Climate Change, Business/Economics/Sustainable Development)

General References

Beardsley, Tim. "Turning Green: Shell International Projects a Renewable Energy Future." *Scientific American* (September 1994): 96-97.

- *Shell's business environment group looks at likely energy use scenarios.*

Canada, Department of Natural Resources, Energy and Fiscal Analysis Division. *Canada's Energy Outlook: 1992-2020*. Ottawa: The Division, 1993.

- *An outlook on energy demand and supply, and energy-related emissions of the principal greenhouse gases, over the next three decades.*

Canada. Energy Options Advisory Committee (Thomas E. Kierns, Chairman).

- *Energy and Canadians in the 21st Century: A Report on the Energy Options Process*. Ottawa: Department of Energy, Mines and Resources, August 1988.
- *A lively examination of Canada's energy policy framework and contemporary issues by a wide range of individuals. The mandate of the Committee was to "assess the technical and policy options which will sustain Canada's position as an energy consuming, producing and trading nation."*

Davis, G.R. "Energy for Planet Earth." *Scientific American* 263:3 (September 1990): 55-62.

Fickett, A., C. Gellings and A. Lovins. "Efficient Use of Electricity." *Scientific American* 263:3 (September 1990): 65-74.

Holdren, J.P. "Energy in Transition." *Scientific American* 263:3 (September 1990): 156-163.

- *Three comprehensive articles which discuss a broad range of current energy issues from a recent issue of Scientific American devoted to energy topics.*

Gates, David R. *Energy and Ecology*. Sunderland, MA: Sinauer Associates, 1985.

- *A readable discussion of the ecological implications of energy extraction, conversion and use.*

Joskow, P.L. and D.B. Marron. "What Does a Negawatt Really Cost? Evidence from Utility Conservation Programs." *The Energy Journal* 13:4 (1992): 41-74.

_____. "What Does Utility-Subsidized Energy Really Cost?" *Science* 260 (16 April 1993): 281, 370.

- *Studies of electricity conservation programs undertaken by ten American utilities have revealed that the true societal costs associated with utilities "purchasing" megawatt hours through subsidies to customers may be substantially higher than first estimated in theoretical studies by the Rocky Mountain Institute and the Electric Power Research Institute.*

Majumdar, S.K., F. Brenner and E.W. Miller, eds. *Environmental Consequences of Energy Production: Problems and Prospects*. Easton, PA: The Pennsylvania Academy of Science, 1987.

- *A useful compilation of articles about renewable and non-renewable energy options. Reviews of environmental problems of fossil fuel, nuclear and hydroelectric power generation and potential technical solutions are clear and understandable to the non-specialist. While coverage is somewhat uneven, this is a useful introduction to environmental issues associated with power generation.*

McRae, Robert N. "Canadian Energy Development under the Free Trade Agreement." *Energy Policy* 19:5 (June 1991): 473-479.

- *A timely review of historical factors affecting Canada's energy trade and the impact of the Free Trade Agreement on trading in oil and natural gas, electricity and coal. Questions of future access to energy supplies are addressed in some detail. Good bibliography.*

Starr, C., M.F. Searl and S. Alpert. "Energy Sources: A Realistic Outlook." *Science* 256 (15 May 1992): 981-987.

- *Projections of energy use to the middle of next century, which incorporate the principal factors which influence future energy resource and technology options. Thorough review of energy demand growth in light of population and economic growth scenarios, as well as evaluations of the impacts of possible global conservation and energy efficiency strategies.*

White, D.C., C.J. Andrews and N.W. Stauffer. "The New Team: Electricity Sources without Carbon Dioxide." *Technology Review* 95 (January 1992): 42-50.

- *Likely future limitations on emissions of carbon dioxide from fossil fuel fired generating stations require consideration of alternative technologies which do not involve burning natural gas, oil or coal, or emit greenhouse gases at lower levels. New nuclear systems, improving renewable options, more efficient transmission of electricity and encouragement of technological change are among the options discussed.*

Ontario Issues

Lees, David. "Living in the Nuclear Shadow." *Toronto Life* (November 1989): 55-67, 92-136.

- *A rarity: an objective article on nuclear power in Ontario, geared to a general audience. This article greatly irritated both the pro- and anti-nuclear lobbies with its irreverent and independent approach to these issues. A provocative essay which should not be missed.*

Ontario. Legislative Assembly. Select Committee on Energy. *Report on Ontario Hydro Draft Demand/Supply Planning Strategy*. 2 vols. Toronto: The Committee, January 1989.

- *A detailed review by an all-party Legislative Committee of the draft version of Ontario Hydro's now abandoned long-range power planning process. This report contains a wealth of information regarding most aspects of energy production and utilization in Ontario. Volume I comprises a consideration of such topics as demand management, independent power, the existing generating system and power planning issues, along with the Committee's recommendations. Volume II provides a summary of the testimony of the expert witnesses and interest groups who appeared before the Committee. This report is effectively a "who's who" of individuals and organizations with an interest in energy planning and is a useful source-book of knowledgeable contacts.*

Ontario. Ministry of Energy. *Ontario Energy Review*. 4th ed. Toronto: The Ministry, March 1990.

- *A compilation of information on production and consumption of oil, gas, coal and electricity in Ontario, along with sections on renewable and alternative energy and conservation and energy efficiency. A useful summary of basic statistics and government programs.*

Ontario Nuclear Safety Review (F. Kenneth Hare, Commissioner). *The Safety of Ontario's Nuclear Power Reactors: A Scientific and Technical Review*. Toronto: Queen's Printer, February 1988.

Ontario Nuclear Cost Inquiry (Ralph F. Brooks, Chair). *Report to the Ministry of Energy*. Toronto: The Inquiry, January 1989.

- *In response to questions raised before Legislative Committees and elsewhere regarding the safety of Ontario's CANDU power plants, and the methods used by Ontario Hydro to calculate the relative costs of nuclear and other power sources, two impartial review commissions were established to report on these matters in some depth. These reports are easily understood and should be essential reading for anyone interested in energy issues.*

*New Age Energy — Windmills and Sunbeams**General Reviews*

Bevington, R. and A.H. Rosenfeld. "Energy for Buildings and Homes." *Scientific American* 263:3 (September 1990): 77-86.

- *Economic implications of energy efficiency measures for commercial and residential buildings.*

Bleviss, D.L. and P. Walzer. "Energy for Motor Vehicles." *Scientific American* 263:3 (September 1990): 103-109.

- *Review of efficient combustion designs, alternative fuels, transportation planning.*

Canada. National Research Council. Division of Energy. *Alternative Energy Technology in Canada: NRC's Energy R & D Program, 1975-1985*. NRCC No. 26612. Ottawa: The Council, September 1986.

- *An overview of Canadian research.*

Emsley, John. "Energy and Fuels." *New Scientist* 141:1908 (15 January 1994): 1-4, Inside Science No. 68.

- *A good overview of the present status of the major non-petroleum based fuels.*

Howard, G. "Flat Out for the Car of the Future." *New Scientist* 136:1846 (7 November 1992): 21-22.

- *a recent review of electric vehicle and battery development.*

Newman, Alan. "Fuel Cells Come of Age." *Environmental Science and Technology* 26:11 (1992): 2085-2086.

- *A good overview of the latest developments in fuel cell technology.*

Organization for Economic Cooperation and Development. *Environmental Impacts of Renewable Energy: The OECD Compass Project*. Paris: The OECD, 1987.

_____. *Environmental Impacts of Renewable Energy: The OECD Compass Project*. Paris: The OECD, 1988.

- *These two OECD reports are excellent reviews of the economic and environmental aspects of renewable energy alternatives.*

Patterson, W. "Energy Issues Another Challenge." *New Scientist* 121 (28 January 1989): 44-50.

Phillips, V. and P. Takahashi. "Renewable Energy Development." *Environmental Science and Technology* 23:1 (January 1989): 10-13.

- *Two good, general articles from reliable journals.*

Robinson, John B., *et al.* "Determining the Long-term Potential for Energy Conservation and Renewable Energy in Canada." *Energy* 10:6 (1985): 689-705.

- *A technical and economic overview by a team of enthusiasts devoted to the cause of renewable and small-scale energy production.*

Rose, Julian. "Biofuel Benefits Questioned." *Environmental Science and Technology* 28:2 (1994): 63A.

- *An economic assessment of European experiences using ethanol and methanol as substitutes for petroleum fuels.*

Wind Power

Clarke, A. "How Green is the Wind?" *New Scientist* 118:1666 (27 May 1989): 62-65.

- *Thought-provoking review of the visual impact, noise and safety aspects of wind power.*

Grubb, M. "The Wind of Change." *New Scientist* 117:1604 (17 March 1988): 43-47.

- *A good survey of the way that wind power might fit into a national electricity grid. Well worth reading.*

Solar Power

Hubbard, H.M. "Photovoltaics Today and Tomorrow." *Science* 244 (21 April 1989): 297-304.

Somerville, D. "Whatever Happened to Solar Energy?" *American Scientist* 77 (July/August 1989): 328-239.

"Sunny Prospects? Photovoltaic Technology Makes Slow but Steady Progress." *Scientific American* 259:2 (August 1988): 98-99.

"Waiting for the Sun." *The Economist* (19 May 1990): 95-98.

Weinberg, C.J. and R.H. Williams. "Energy from the Sun." *Scientific American* 263:3 (September 1990): 147-155.

- *A selection of recent articles from reliable journals. All are concise and understandable, and discuss costs, technologies and industrial infrastructures associated with developing solar energy. Weinberg and Williams' article includes analyses of wind and biomass energy as well.*

Note: Additional alternative energy technologies such as geothermal or tidal power appear to have less relevance to Ontario than is the case in other jurisdictions.

Environmental Assessment

(See Also: Law, Public Policy and Environmental Research)

Environmental Assessment and Environmental Assessment Boards: 1990 Edition. Mississauga, ON: Insight Press, 1990.

- *A collection of papers presented at a seminar in February 1990. Largely legal in their points of view, the articles describe a range of issues associated with the practice of environmental assessment in Ontario. The focus is on the process of assessment rather than environmental protection.*

Jeffrey, M.I. "Consideration and Analysis of Conditions of Approval Likely to be Imposed by the Environmental Assessment Board in Granting Project Approval." *Canadian Journal of Administrative Law and Practice* 1 (1987-88): 21-42.

- *A former Chair of Ontario's Environmental Assessment Board discusses many aspects of conditional approvals.*

_____. *Environmental Approvals in Canada: Practice and Procedure.* Toronto: Butterworths, 1989.

- *A looseleaf service, periodically updated, which discusses federal and provincial environmental regimes with respect to the nature of the review processes, strengths and weaknesses, and reform initiatives. Other related regulatory legislation is also described.*

_____ and O.P. Dwivedi. "Environmental Assessment Board of Ontario." *The Environmental Professional* 10 (1988): 257-265.

- *A concise overview of the Environmental Assessment process in Ontario including case studies.*

Ontario. Environmental Assessment Board. *The Hearing Process: Discussion Papers on Procedural and Legislative Change*. Toronto: The Board, 1990.

- *The EA Board sought public input on possible reforms to the process for conducting environmental hearings. Topics discussed include: methods of handling procedural matters not related to evidence; the need for expert staff for the Board; mechanisms for introducing direct evidence in largely written form; and other methods of narrowing the range of issues included in hearings to those which cannot otherwise be resolved. The thrust is to find ways of conducting environmental assessments in a timely manner.*

Ontario. Ministry of the Environment, Environmental Assessment Branch. *The Ontario Environmental Assessment Act as it Relates to Waste Management Planning*. Toronto: The Branch, 1992.

- *An overview of the environmental legislation and its requirements and processes for those unfortunate souls involved in waste management planning.*

Ontario. Ministry of the Environment. *A Proponent's Guide to Environmental Assessment*. Toronto: The Ministry, n.d.

- *A brief overview of submission requirements from the provincial Ministry's point of view. Includes a list of other Ministry publications related to the assessment process.*

Parkinson, John G. "The Ontario Municipal Board's Changing Role." *Municipal World* 98:3 (March 1988): 68-69.

- *Many planning initiatives which go before the OMB have environmental implications, and joint hearings of the OMB and EAB often occur to reduce duplication of evidence. This article by a lawyer with extensive experience before these Boards contains much insight into the roles of the OMB and the municipalities in the planning process.*

Environmental Hypersensitivity

This condition, also known as total allergy syndrome, twentieth-century disease, environmentally-induced disease and other terms, is controversial and complex, and appears to be poorly understood by the public and health professionals. Opinions are polarized on many aspects of diagnosis and treatment, but some people are quite ill. The following references may provide an initial overview of current issues.

American College of Physicians. "Clinical Ecology: Position Paper." *Annals of Internal Medicine* 111:2 (15 July 1989): 169.

Ashford, N.A. and C.S. Miller. *Chemical Exposures: Low levels and High Stakes*. New York: Van Nostrand Reinhold, 1991.

Ontario, *Ad Hoc* Committee on Environmental Hypersensitivity Disorders (George M. Thomson, Chair). *Report*. Toronto: The Committee, August 1985.

Ontario. Advisory Panel on Environmental Hypersensitivity (Barry Zimmerman, Chair). *Report*. Toronto: The Panel, September 1986.

Ontario Medical Association. Committee on Public Health. *Report to Council, 1987: Environmental Hypersensitivity Disorders*. Toronto: The Association, 1987. Paragraphs 16-18.

Food and Nutrition

Gallagher, Charlette R. and John B. Allred. *Taking the Fear Out of Eating: A Nutritionists' Guide to Sensible Food Choices*. Cambridge: Cambridge University Press, 1992.

- *The key word in this title is "sensible". Having read scores of books and articles on various food issues, this is by far the best discussion of vitamins, additives, organic food production, preservation by irradiation and other topical issues that I have yet seen. Also good sections on diet impacts on cancer and heart disease. Highly recommended!*

Willett, Walter C. "Diet and Health: What Should We Eat?" *Science* 264 (22 April 1994): 532-537.

- *An outstanding review of what is currently known about dietary factors in the cause and prevention of important diseases.*

Goods and Services

(See Also: Business/Economics/Sustainable Development, Education, Law)

"Annual Buyer's Guide 1995." *Waste Business Magazine* (January 1995): 22-30.

- *A directory of Canadian and American consultants, equipment suppliers, analytical laboratories, etc.*

Bygott, J.M. and J.C. McDonald. "Government Environmental Records: A Key to Site Assessment and the Due Diligence Process." *Hazardous Waste Management* (October 1994): 28-30.

- *A useful list of federal and provincial environmental data bases.*

Canada, Department of the Environment, Environmental Choice Program. *Certified Products and Services*. Ottawa: The Program, 1994.

- *A periodically-updated list of "green" products which meet the Program's criteria. Examples include re-refined motor oils, water-based paints and fine paper from recycled paper.*

Canada, Department of Fisheries and Oceans. *Catalogue of Nautical Charts and Related Publications; Central Canada*. Ottawa; Canadian Hydrographic Service, 1991.

- *A list of available nautical charts, small-craft harbour charts and other descriptive materials for the Great Lakes and other waterways.*

Canada, Department of Foreign Affairs and International Trade. *Canada...A World Leader in Environmental Products and Services*. Ottawa: The Department, 1993.

- *A directory of environmental goods and services geared toward the export market. Includes suppliers of air pollution control, hazardous waste, oil spill, recycling site reclamation, and other services and equipment.*

"Environmental Lab Supplement." *Hazardous Materials Management* (April 1993): 26-38.

- *A survey of the state of environmental testing laboratories in Canada.*

"Environmental Products and Services: 1995 Directory and Buyer's Guide." *Hazardous Materials Management* (December 1994): 41-72.

- *A list of firms offering consulting, environmental auditing, laboratory, legal and other environmental services.*

Farr, Moira. "Architects and the Environment." *The Canadian Architect* (March 1991): 20-24.

- *A good source for architects and builders to identify energy-efficient and environmentally friendly construction materials.*

Manuel, John and L.D. Ludlow. *Purchasing of Products Containing Post-Consumer Waste and/or Products which are Environmentally Sound*. Toronto: City of Toronto, M.M. Dillon Limited, 1990.

- *A sourcebook that identifies "green" products and distributors for use by government purchasing agents.*

"1994 Environmental Software and CD-ROM Supplement." *Hazardous Materials Management* (October 1994): 70-75.

- *Descriptions of several environmental software programs.*

Ontario, Ministry of Environment and Energy. *Ontario's Green Industries*. Toronto: The Ministry, 1994.

- *A directory of companies offering environmental and pollution control services.*

Ontario, Ministry of Natural Resources. *Share Ontario's Outdoors: Products Catalogue*. Toronto: The Ministry, 1994.

- *List of available topographic and other maps as well as aerial photographs.*

Hazardous Wastes

(See Also: Toxic Chemicals, Law)

Asnate-Duah, D.K., F.F. Saccomanno and J.H. Shortreed. "The Hazardous Waste Trade: Can It be Controlled?" *Environmental Science and Technology* 26:9 (1992): 1684-1693.

- *A very comprehensive review of the international trade in hazardous wastes. Prepared by scientists and engineers from the University of Waterloo.*

Crittenden, Guy. "Burn or Bury: Hazardous Waste Incinerators and Class One Landfills in Canada." *Hazardous Materials Management* 4:5 (October 1992): 6-8.

- *A partial inventory of hazardous waste treatment activities across Canada.*

Foster, B.E. "Transportation Policy: A Guide to the Regulations." *Hazardous Materials Management* (October 1990): 8-13.

- *A good overview of the federal Transportation of Hazardous Goods Act and its Regulations, with comments on other related federal and provincial legislation affecting hazardous waste transport.*

Fleming, Anthony. "Hazardous Waste and the Law: Legislation for Industry in Canada." *Hazardous Materials Management* 5:2 (April 1993): 6-12.

- *A review of federal and provincial legislation relating to hazardous wastes.*

Johnson, N.P. and M.G. Cosmos. "Thermal Treatment Technologies for Hazardous Waste Remediation." *Pollution Engineering* (October 1989): 66-84.

- *Useful descriptions of available and emerging technologies used to treat hazardous wastes.*

Kummer, Katharina. "The International Regulation of Transboundary Traffic in Hazardous Wastes: The 1989 Basel Convention." *International and Comparative Law Quarterly* 41:3 (July 1992): 530-562.

- *Outlines the background, scope, and restrictions and gives a general assessment of the Basel Convention. This treaty was the first attempt at comprehensive regulation of international transport and disposal of hazardous wastes on a global level.*

LaGrega, M.D., P.L. Buckingham and J.C. Evans. *Hazardous Waste Management*. New York: McGraw Hill, 1994.

- *A comprehensive and readable basic textbook on all areas of hazardous waste management, including fate and transport of contaminants, toxicology, current management practices, treatment and disposal methods, and site remediation. A good place to begin.*

Laidlaw Environmental Services Ltd. *The Tricil Guide: Your Guide on What to Know, What to Do, and Where to Find Out about Hazardous Waste Legislation in Ontario*. Burlington, ON: Laidlaw, 1989.

- *A convenient summary of provincial and federal regulations and key contacts in the hazardous waste field.*

Ontario Waste Management Corporation. *The OWMC Press Guide Series*. Toronto: The Corporation, various dates.

- *A useful series of overview guides to various aspects of hazardous waste management, including:*

- #1. *"The Ontario Hazardous Waste Source Book";*
- #2. *"A Glossary of Hazardous Waste Management";*
- #3. *"A Reporter's Guide to the Chemicals in Today's Headlines"; and,*
- #4. *"A Reporter's Guide to Hazardous Waste Management Technologies".*

Robins, B. "Provincial Haz-Waste Practices." *Hazardous Materials Management* 2:6 (December 1990): 6, 8.

- *A brief summary of provincial spending and regulatory programs related to hazardous wastes.*

Skinner, John H. "A Global Look at Hazardous Wastes." *Waste Age* (April 1988): 255-263.

- *A useful overview of how numerous jurisdictions have approached the registration and transport of hazardous wastes as well as the planning, permitting and establishment of treatment/disposal facilities.*

Law

(See Also: Environmental Assessment, Public Policy, Hazardous Wastes)

Environmental law is a specialized and rapidly evolving field, worthy of a review of its own. A few items I have found to be interesting or useful are listed below.

Abella, Rosalie Silverman. "The Independence of Administrative Tribunals." *Law Society Gazette* 26:2 (June 1992): 113-121.

Bisson, D. "Site Decommissioning and Remediation." *Environmental Law Alert* (April 1992): 1-3.

Canadian Environmental Law Research Foundation. "An Overview of Canadian Law and Policy Governing Great Lakes Water Quality Management." *Case Western Reserve Journal of International Law* 18 (1986): 109-153.

Deturbide, Michael. "Corporate Protector or Environmental Safeguard? The Emerging Role of the Environmental Audit." *Journal of Environmental Law and Practice* 5:1 (December 1994): 1-21.

Duffy, D.P. and J.E. Potter. "Environmental Auditing: A Profession Comes of Age." *Environmental Science and Technology* 26:9 (1992): 1706-1708.

Duplessis, D. and B. Trenholm. "What Constitutes Reasonable Care?" *CA Magazine* 125:12 (December 1992): 41-43.

Fleming, Anthony. "Environmental Legislation in Review." *Hazardous Materials Management* 6:2 (April 1994): 8-12.

Grodinsky, W.S. "Aboriginal Claims to Water Resources." *Canadian Speeches: Issues of the Day* (December 1992): 38-42.

Hoberg, George. "Sleeping with an Elephant: The American Influence on Canadian Environmental Regulation." *Journal of Public Policy* 11:1 (January-March 1991): 107-131.

Huber, Peter W. *Galileo's Revenge: Junk Science in the Courtroom*. New York: Basic Books, 1991.

Leew, E.A. and M. Thackeray. "Recent Judicial Developments of Interest to Oil and Gas Lawyers." *Alberta Law Review* 30:1 (1992): 308-377.

"Legal Update: Environmental Law." *Canadian Lawyer* (May 1992): 40-45.

McLeod, Roderick M. "Key Environmental Issues for the 1990s and Beyond in Canada." *Canada-United States Law Journal* 18 (1992): 23-43.

Phypher, J. and B. Ibbotson. *The Handbook of Environmental Compliance in Ontario*. Toronto: McGraw-Hill Ryerson, 1991.

Poch, Harry. *Corporate and Municipal Environmental Law*. Toronto: Carswell, 1989.

_____. and T. Archibald. "Environmental Inspections: When Not to Talk." *Hazardous Materials Management* (February 1991): 31-32.

Power, R.G. and B. Spiegel. "Conflicting Cleanup Enforcement Trends." *Hazardous Materials Management* (October 1994): 26.

Randi, James. "Lawyers, Lies and Liability." *Nature* 354 (28 November 1991): 330-331.

Saxe, Dianne. "The Accreditation of Environmental Professionals." *Hazardous Materials Management* (December 1994): 90-91.

_____. "Are You Liable and What About Tenants?" *Hazardous Materials Management* (October 1994): 57-58.

_____. "Don't Call it 'Waste' if it Isn't." *Hazardous Materials Management* (October 1993): 22-24.

_____. "Environmental Audits and Assessments: The Problem of Risk." *Hazardous Materials Management* (February 1991): 6-8.

_____. "Environmental Bill of Rights." *Hazardous Materials Management* (August 1993): 33-34.

_____. "Environmental Law and the Mineral Industry." *Hazardous Materials Management* (June 1990): 10-16.

_____. "How Clean is Clean?" *Hazardous Materials Management* (February 1992): 12.

_____. "Industry Custom is Not Enough." *Hazardous Materials Management* (April 1993): 56-57.

_____. "Startling Amendments to Ontario's Environmental Laws." *Hazardous Materials Management* (October 1990): 21-23.

Schwarzer, William W. *Reference Manual on Scientific Evidence*. Washington: Federal Justice Center, 1994.

Stammer, B.J. "Diligent Conduct: The Best Defence Against Environmental Liability." *Engineering Dimensions* (September/October 1994): 38-39.

Thomson, Doug. "Interpreting Environmental Exclusion Clause in Insurance Policy." *Municipal World* (December 1994): 5-6.

Municipal Waste Management

(See Also: Parks and Urban Issues, Environmental Assessment)

Numerous articles and books are available describing all aspects of municipal waste production and management. The following items should serve as a basic introduction to the subject.

The Bio Cycle Guide to Yard Waste Composting. Emmaus, PA: J.G. Press, 1989.

- *A thorough treatment of many aspects of home composting from the staff of Bio Cycle magazine, a publication for compost enthusiasts.*

Canada, Department of the Environment. *The National Incinerator Testing and Evaluation Program*. Ottawa; The Department, 1991.

- *A summary of the NITEP studies which examined the burning characteristics and emissions from a number of types of municipal solid waste incinerators.*

Ellison, William. "Overseas Practices in Municipal Waste Combustion." *Hazardous Materials Management* (August 1990): 44-48.

- *Up-to-date information on waste incineration, emissions research and implementation programs in Europe, Asia and North America.*

Gore and Storrie Limited, and Decima Research Limited. *Residential Waste Composition Study*. Volume I of the Ontario Waste Composition Study. Toronto: Ontario Ministry of the Environment, Waste Management Branch, January 1991.

Gore and Storrie Limited. *Commercial Waste Composition Study*. Volume II of the Ontario Waste Composition Study. Toronto: Ontario Ministry of the Environment, Waste Management Branch, July 1991.

_____. *Procedures for the Assessment of Solid Waste: Residential and Commercial*. Volume III of the Ontario Waste Composition Study. Toronto: Ontario Ministry of the Environment, Waste Management Branch, July 1991.

- *The first two volumes present the first detailed look at the composition of household and business solid wastes in several Ontario communities. This is important information when developing waste management plans and assessing their effectiveness. The third volume outlines the methodology so it can be efficiently used by municipalities to carry out their own waste composition studies for planning purposes.*

Kovacic, David, R.A. Cahill and T.J. Bicki. "Compost: Brown Gold or Toxic Trouble?" *Environmental Science and Technology* 26:1 (1992): 38-41.

- *This article points out the general lack of testing for metals, pesticides and other contaminants in compost used on gardens and agricultural land.*

Liptak, B.G. *Municipal Waste Disposal in the 1990s*. Radnor, PA: Chilton Books, 1991.

- *A good introduction to the organizational and technical aspects of landfilling, incineration and other methods of dealing with municipal solid waste and sewage sludge, with emphasis on American examples.*

Lund, H.F. *The McGraw-Hill Recycling Handbook*. New York: McGraw-Hill, 1993.

- *A strong overview of all aspects of solid waste recycling. American-oriented, but current and comprehensive.*

Mackenzie, Patricia. "Waste Management: A Canadian Overview." *Civic Public Works* 94:46 (January/February 1994): 16-17.

- *A concise and insightful review of national, provincial and municipal waste initiatives written by an Edmonton Alderman. Includes a list of Edmonton's waste reduction programs which should interest other municipalities.*

Modig, Staffan. "Waste Management in Sweden: A Problem Area with Many Solutions." *Viewpoint Sweden* 6 (May 1991): 1-7.

- *An interesting report from the Swedish Information Service outlining current thoughts on waste management. Sweden placed considerable emphasis on scientific evaluation of waste reduction and management options long before*

many other countries did so. This article summarizes the results of these efforts concisely and effectively.

O'Leary, P.R., P.W. Walsh and R.K. Ham. "Managing Solid Waste." *Scientific American* 259:6 (December 1988): 36-42.

- *A good overview of solid waste management issues in the United States. Most of the information contained is quite relevant to Ontario.*

Ontario, Ministry of the Environment, Waste Management Branch. *Waste Disposal Site Inventory*. Toronto: The Branch, June 1991.

- *This report details the locations and characteristics of known active and closed waste disposals sites throughout Ontario.*

Ontario, Ministry of Environment and Energy. *Municipal 3Rs Infrastructure: A Reference Guide; International Case Studies*. Toronto: The Ministry, 1994.

- *A survey of waste management initiatives in other jurisdictions which might prove interesting to Ontario municipalities.*

Rathje, William J. and Cullen Murphy. *Rubbish: The Archaeology of Garbage*. New York: HarperCollins, 1992.

- *An important book by the father of garbage dump archaeology. By carefully excavating landfills dating back many decades, Rathje has made important discoveries about the nature and fate of disposed materials, and has challenged many of the popular myths that have developed about municipal solid waste.*

Rose, Julian. "Incineration Regulations Set to Tighten." *Environmental Science and Technology* 28:12 (1994): 512A.

- *A review of European and American emission limits.*

Steverson, E. Malone. "Provoking a Firestorm: Waste Incineration." *Environmental Science and Technology* 25:11 (1991): 1808-1814.

- *An excellent overview of the issues associated with incineration of wastes. Modern incineration systems are discussed with respect to air emissions, residuals, risk and public acceptance. A useful summary of current incineration technology is provided.*

Steuteville, Robert. "The State of Garbage in America." *Bio Cycle* 35:4 (April 1994): 46-52.

- *An article that covers an annual U.S. nationwide survey on waste management. It summarizes recent programs, legislation, statistics and funding in American states.*

Suflita, Joseph M., *et al.* "The World's Largest Landfill: A Multidisciplinary Investigation." *Environmental Science and Technology* 26:8 (1992): 1486-1494.

- *An example of the garbage dump archaeology done by William Rathje's "Garbage Project." Results of excavations at a huge landfill on Staten Island, New York which dates back to the 1940s. An important account of the fate of urban waste when landfilled.*

Taylor, Paul. "Heavy Metals Criteria for Compost." *Resource Recycling* (September 1991): 68-80.

- *An important look at the achievability of target heavy metals levels in the proposed Environmental Choice Program Criteria for Compost issued under the auspices of Environment Canada. The limited data now available appear to suggest that standards are achievable if source separation of wastes is pursued, and not achievable when mixed municipal solid waste is processed.*

United States Congress. Office of Technology Assessment. *Facing America's Trash: What Next for Municipal Solid Waste?* OTA-0-424. Washington, DC: US Government Printing Office, October 1989.

- *A thorough treatment of solid waste reduction and management options from both technical and policy viewpoints. An essential and comprehensive introduction to the subject.*

United States, Environmental Protection Agency. *Waste Prevention, Recycling and Composting Options: Lessons from 30 U.S. Communities.* EPA530-R-92-015. Springfield, VA: National Technical Information Service, 1994.

- *A valuable review of existing waste reduction and recycling programmes which identifies strengths and weaknesses regarding strategies, recovery levels, markets, and the costs of recycling and composting. An overview of Guelph, Ontario's wet/dry collection system, including results and projected costs is appended.*

University of Wisconsin/Waste Age. "Materials Recycling and Waste Processing." *Waste Age* (February 1986): 88-94.

- *The University of Washington produced a monthly series of lessons for a waste management correspondence course, published in 1986 in Waste Age magazine. These are straightforward technical articles on landfill design, waste recycling, incineration, etc. rather than policy-oriented discussions.*

Natural History

(See Also: Ecology and Ecosystems, Biodiversity/Extinction, Rabies, Zebra Mussels/Exotic Species)

There are numerous field guides and monographs of interest to the serious naturalist, and it is beyond the scope of this paper to attempt a serious review of these materials. A few of the major references I have found useful are listed below. These tend to contain information on habitats, biology and ecological relationships in addition to identification guides and distributional data. They also contain useful bibliographies for further guidance.

General References

Allaby, M., ed. *The Oxford Dictionary of Natural History*. Oxford, UK: Oxford University Press, 1985.

- *A readable, comprehensive and authoritative source of information.*

Allen, G.M., P. Eagles and S. Price., eds. *Conserving Carolinian Canada: Conservation Biology in the Deciduous Forest Region*. Waterloo, Ontario: University of Waterloo Press, 1990.

- *Southern Ontario contains important areas of Carolinian habitats, typical of more southern conditions. A valuable guide to an important and underappreciated resource.*

Clayton, J.S., et al. *Soils of Canada*. Ottawa: Canada Department of Agriculture, Research Branch, 1977.

- *Maps and text describing Canadian soil types and their distributions.*

"Coastal Wetlands of the Laurentian Great Lakes." *Journal of Great Lakes Research* 18:4 (1992).

- *A special issue largely devoted to extensive reviews of the plants, animals and ecology of wetlands along the Great Lakes shoreline.*

Dayton, Leigh. "New Life for Old Forest." *New Scientist* 128 (13 October 1990): 25-29.

- *An important discussion of forestry issues with emphasis on Canadian examples. An introduction to "new forestry" concepts rather than a pro- or anti-logging tract. Quite thought provoking!*

Judd, W.W. and J.M. Spiers, eds. *A Naturalist's Guide to Ontario*. Toronto: University of Toronto Press, 1964.

Chapman, L.J. and D.F. Putnam. *The Physiography of Southern Ontario*. 3rd ed. Ontario Geological Survey, Special vol. 2. Toronto: Ontario Ministry of Natural Resources, 1984.

- *Two essential classics which provide overviews of natural communities, glacial geology, surface features, river drainages, land use and settlement patterns.*

Royal Commission on the Northern Environment (J. Fahlgren, Commissioner). *North of 50°: An Atlas of Far Northern Ontario*. Toronto: University of Toronto Press, 1985.

- *A fair effort at compiling diverse economic and environmental information for northern Ontario. Already quite dated, this is an attractively presented but somewhat shallow treatment that may be a useful starting point for those dealing with northern issues for the first time.*

Turner, B.L. and Karl W. Butzer. "The Columbian Encounter and Land-Use Change." *Environment* 34:8 (October 1992): 16-20, 37-44.

- *A major review of land-use changes brought about by European colonization of the Americas. A very important article for those interested in biodiversity or environmental change.*

Wiken, Ed. *Terrestrial Ecozones of Canada*. Ecological Land Classification Series, 0823-406X, No. 19. Canada, Department of the Environment, Lands Directorate. Ottawa: Supply and Services Canada, 1986.

- *Ecological land classification combines soils, vegetation and physiographic information to describe the types of habitats in the country. A useful way of looking at the province's ecological potentials and sensitivities.*

Plants and Animals

Alex, J.F. and C.M. Switzer. *Ontario Weeds: Descriptions, Illustrations and Keys to their Identification*. Publication 505. Toronto: Ontario Ministry of Agriculture and Food, 1976.

- *A wonderful guide to wild plants, many of which are difficult to think of as "weeds".*

Hosie, R.C. *Native Trees of Canada*. 8th ed. Toronto: Fitzhenry and Whiteside, 1979.

- *An easy-to-use introduction to trees found in Ontario and their characteristics.*

Scoggan, H.J. *The Flora of Canada, Part I: General Survey*. Ottawa: National Museum of Natural Sciences, 1978.

- *An overview of Canadian plant life. Several detailed volumes on specific plant groups complete the series.*

Walshe, S. *Plants of Quetico and the Ontario Shield*. Toronto: University of Toronto Press, 1980.

- *A bit technical but a good reference on the plants of Northern Ontario, a subject too often neglected.*

Banfield, A.W.F. *The Mammals of Canada*. Toronto: University of Toronto Press, 1974.

Van Zyll de Jong, C.G. *Handbook of Canadian Mammals*. Multivolume Series. Ottawa: National Museum of Natural Sciences, various dates.

- *The Banfield book is an overview of all Canadian mammals, whereas the series by Van Zyll de Jong treats taxonomic groups of mammals in considerable detail.*

Canada, Department of the Environment, Canadian Wildlife Service. *Endangered Species in Canada*. Ottawa: The Service, 1989.

Godfrey, W.E. *The Birds of Canada*. 2nd ed. Ottawa: National Museum of Natural Sciences, 1986.

- *An useful overview of the distributions, characteristics and habits of migratory and resident avifauna.*

International Union for Conservation of Nature and Natural Resources, Conservation Monitoring Centre. *1986 IUCN Red List of Threatened Animals*. Cambridge, UK.: IUCN, United Nations Environment Programme, 1986.

- *Periodically updated listing of endangered species around the world.*

Johnson, James E. *Protected Fishes of the United States and Canada*. Bethesda, MD: American Fisheries Society, 1987.

- *A comprehensive listing, by state and province, of fishes receiving legal protection and of special concern.*

Ontario Hydro, Environmental Resources Section. *Field Guide to Endangered, Threatened and Rare Species in Ontario*. Toronto: The Section, 1980.

- *A useful, practical overview for use in environmental baseline studies and assessments.*

Scott, W.B. and E.J. Crossman. *Freshwater Fishes of Canada*. Bull. 184, Fisheries Research Board of Canada. Ottawa: Environment Canada, 1973.

- *A superb account of Canadian fishes, including authoritative summaries on each species: description, taxonomy, distribution, biology and relation to man. A valuable reference in a readable style.*

Ozone Depletion

(See Also: Air Quality, Public Policy and Environmental Research, Climate Change)

References relating to depletion of the earth's protective stratospheric ozone layer by chlorofluorocarbons (CFCs) are legion. By all measures, the Antarctic ozone hole is becoming a more serious problem, and thinning of the ozone layer over Canada is a concern which is being closely monitored. The following are key recent reviews of the policy and scientific aspects of one global environmental issue that appears to be an imminent hazard.

Cicerone, R.J., S. Elliott and R.P. Turco. "Global Environmental Engineering." *Nature* 356 (9 April 1992): 472.

- *A concise overview of the problem, its cause, and the substantial efforts and risks involved with large-scale corrective measures that may be required. An effective appeal for greater public policy and scientific debate on these issues.*

Cooper, M.H. "Ozone Depletion." *C.Q. Researcher* 2:13 (3 April 1992): 289-307

- *An overview of the issue, including history and key dates, technical aspects, and outlook. Prepared for members of U.S. Congress and geared to non-specialists with public policy interests.*

Doniger, D. "Politics of the Ozone Layer." *Issues in Science and Technology* 4:3 (Spring 1988): 87.

Glenn, William. "Canada Moves Quickly on CFCs and Halons." *Occupational Health and Safety Canada* 9:3 (May-June 1993): 22-26.

- *A useful overview of federal and provincial initiatives to address depletion of stratospheric ozone.*

Kerr, J.B. Decreasing Ozone Causes Health Concern: How Canada Forecasts Ultraviolet-B Radiation." *Environmental Science and Technology* 28:12 (1994): 514A-518A.

- *A description of how the status of the ozone layer over Canada is monitored.*

Penkett, Stuart. "Changing Ozone: Evidence for a Perturbed Atmosphere." *Environmental Science and Technology* 25:4 (1991):631-635

- *A good updated summary of the physical and chemical evidence of ozone depletion. Authoritative and interesting.*

Roan, S.L. *Ozone Crisis: The 15-Year Evolution of a Sudden Global Emergency.* New York: Wiley, 1989.

Rowland, F. Sherwood. "Stratospheric Ozone in the 21st Century: The Chlorofluorocarbon Problem." *Environmental Science and Technology* 25:4 (1991) 622-628.

- *A thorough recent review of what is known about the atmospheric chemical processes responsible for degradation of the protective layer, and the roles played by emissions of man-made and natural compounds.*

Stolarski, Richard, *et al.* "Measured Trends in Stratospheric Ozone." *Science* 256 (17 April 1992): 342-349.

- *The latest scientific review of the status of ozone depletion based on analysis of data from many centres around the world. Technical, but a valuable summary for those who wish to evaluate the current evidence.*

Wallington, T.J., *et al.* "The Environmental Impact of CFC Replacements: HFCs and HCFCs." *Environmental Science and Technology* 28:7 (1994): 320A-326A.

- *A current review of potentials for ozone depletion, global warming and formation of toxic/noxious degradation products by CFC-replacements.*

World Meteorological Organization. *Conference Proceedings. The Changing Atmosphere: Implications for Global Security.* WMO Report No. 710. Downsview, ON: Canadian Climate Centre, 1988.

Parks and Urban Issues

(See Also: Goods and Services, Ecology and Ecosystems, Education, Environmental Assessment, Law, Municipal Waste Management)

Burgens, J., C. Harrison and M. Limb. "People, Parks and the Urban Green: A Study of Popular Meanings and Values for Open Spaces in the City." *Urban Studies* 25:6 (1988): 455-473.

Driver, B.L., D. Rosenthal and G. Peterson. "Social Benefits of Urban Forests and Related Green Spaces." *Environmental Comment* (November 1980): 13-16.

Talbot, J.F., L. Bardwell and R. Kaplan. "The Functions of Urban Nature: Uses and Values of Different Types of Urban Nature Settings." *Journal of Architectural and Planning Research* 4:1 (1987): 47-63.

- *Three useful articles on urban green space.*

Canada. Department of the Environment. Task Force on Park Establishment (John B. Theberge, Chair). *Parks 2000: Vision for the 21st Century.* Toronto: Nature Conservancy of Canada, 1987.

- *A good summary of the historical development of Canada's national parks and the rationale for new park selection.*

Cardarelli, Robert. "The Cost of Contamination." *The Canadian Architect* 38:4 (April 1993): 29-30.

- *A guide for architects to advise clients on the best way to deal with contaminated materials and sites.*

Curry, D.G. "Municipal Action to Protect the Ozone Layer." *Municipal World* (January 1991): 9-15.

- *A good summary and checklist for municipalities with respect to chlorofluorocarbons (CFC) recovery and recycling, materials purchasing and other activities.*

Dempster, D.P. "How to Save Trees from the Bulldozer." *Civic Public Works* (February 1989): 10-12, 16.

- *A practical article on tree tolerances to root damage and means of protecting trees during construction activities.*

The Environmental Applications Group Limited, *et al.* *An Evaluation of Lakefilling Activities in Ontario: Final Report*. Prepared for the Lakefill Task Force, Ontario Ministry of the Environment. Toronto: The Ministry, 1988.

- *A major compilation of environmental, economic and coastal engineering information for shoreline stabilization, land creation and dredge disposal projects using lakefilling techniques. The report and appendix include a compendium of Ontario's lakefill projects along with detailed discussions of the environmental benefits and costs of fill placement, socioeconomic implications and recommendations for policy development for ensuring environmental control.*

Fowler, E.P. "Land Use in the Ecologically Sensible City." *Alternatives* 18:1 (1991): 26-35.

- *Proposals for "ecologically sensible" urban planning. Judge for yourself.*

Gorrie, Peter. "Urban Squatters". *Canadian Geographic* (September/October 1992): 38-46.

- *An interesting introduction to urban wildlife, emphasizing the changing relationship between people and animals, particularly raccoons, in Canadian cities. More and more city dwellers see raccoons and other creatures as sharing the urban environment, rather than being the "pests" they were once considered. Good tips on raccoon-proofing your chimney, attic, etc.*

Hough, Michael. *City Form and Natural Process: Towards a New Urban Vernacular*. New York, NY: Van Nostrand Reinhold, 1984.

_____. *Out of Place: Restoring Identity to the Regional Landscape*. New Haven, CT: Yale University Press, 1990.

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- and S. Barrett. *People and City Landscapes: A Study of People and Open Space in Metropolitan Areas of Ontario*. Toronto: Conservation Council of Ontario, 1987.
- *Three impressive publications from Toronto landscape architect Michael Hough. Strong on environmental values and the conservation ethic in urban land use planning.*
- McHarg, Ian L. *Design With Nature*. Garden City, NY: Natural History Press, 1969.
- *If you only read one book from this section, make it this one! McHarg was ahead of his time in identifying the design factors that make cities liveable, whether old or modern, and incorporating those factors into the planning and design process.*
- Mega, V. "Improving the Urban Environment: European Challenges." *Ambio* 23:7 (November 1994): 451-454.
- *An interesting overview of innovative projects related to improving the quality of urban environments in the context of sustainability.*
- Moll, G. and S. Ebenreck, eds. *Shading our Cities: A Resource Guide for Urban and Community Forests*. Washington, DC: Island Press, 1989.
- *A thoughtful and wide-ranging collection of essays by urban foresters and others interested in the economic and ecologic benefits of urban tree cover.*
- Nelson, A.C., J. Genereux and Michelle Genereux. "Price Effects of Landfills on House Values." *Land Economics* 68:4 (November 1992): 359-365.
- The authors employed an empirical model to estimate the price effects of one Minnesota landfill on the value of 708 nearby homes during the 1980s.
- Toronto, Department of Public Health. *Toronto: State of the Environment*. Toronto: The Department, May 1988.
- *An overview of environmental quality in a major urban area from the public health point of view.*
- Wilkinson, P.F. "The Historical Roots of Urban Open Space Planning." *Leisure Studies* 7:2 (May 1988): 125-143.
- *Interesting insight into present urban design's historical antecedents.*

Population Stress and Poverty

(See Also: Business/Economics/Sustainable Development, Ecology and Ecosystems, Agriculture)

World population in mid-1992 was 5.5 billion; and over one billion of these people live in absolute poverty, 212 million more than in 1970. Annual additions to world population in the next decade will average 97 million; almost half in Africa and South Asia. Population control is not a cause embraced by many politicians, but the potential for huge increases in poverty and social disruption throughout the world is substantial. New outbreaks of serious infectious diseases such as acquired immunodeficiency syndrome (AIDS) and drug-resistant tuberculosis in poor, crowded areas around the world make these issues relevant to all.

The following items will serve as an introduction to these issues. The entire February 1992 issue of the journal *Ambio* was devoted to population, natural resources and development and is worth consulting for an international perspective.

Briscoe, John. "When the Cup is Half Full: Improving Water and Sanitation Services in the Developing World." *Environment* 35:4 (May 1993): 7-37.

- *A discussion of water supply and treatment needs in developing countries. Numerous case studies of innovative projects are provided.*

Brown, Phyllida. "The Return of the Big Killer." *New Scientist* 136 (10 October 1990): 30-37.

- *Tuberculosis and poverty in New York City and the Third World.*

Clark, William. "Managing Planet Earth." *Scientific American* 261:3 (September 1989): 47-54.

Culliton, B.J. "Drug-resistant TB May Bring Epidemic." *Nature* 356 (9 April 1992): 473.

Dasgupta, Partha S. "Population, Poverty and the Local Environment." *Scientific American* (February 1995): 40-45.

Environmental Protection or Imperialism?" *Nature* 363 (24 June 1993): 657-658.

Florman, S.C. "Overpopulation Alarm." *Technology Review* 97:7 (1994): 65.

Forsyth, Adrian. "No New Worlds." *Equinox* 64 (July/August 1992): 84-95.

Gibson, J.E. and F. Halter. "Strengthening Environmental Law in Developing Countries." *Environment* 36:1 (January/February 1994): 40-43.

Keyfitz, Nathan. "The Growing Human Population." *Scientific American* 261:3 (September 1989): 119-126.

MacNeill, Jim. "Strategies for Sustainable Economic Development." *Scientific American* 261:3 (September 1989): 155-165

Massignon, N. "The Urban Explosion in the Third World." *The OECD Observer* 182 (June/July 1993): 18-22.

Ohlin, G. "The Population Concern." *Ambio* 21:1 (February 1989): 6-9

United Nations Family Planning Agency. "Results of Population Growth." *Environmental Policy and Law* 22:3 (1992): 135-136.

Public Policy / Environmental Research

(See also: Business/Economics/Sustainable Development, Education, Law)

Alm, Alvin L. "Tools to Protect the Environment: A Need for New Approaches." *EPA Journal* 18:2 (May/June 1992): 7-11.

- *The U.S. EPA is developing new "tools" involving, for example, market incentives and scientific innovation to replace the effective but expensive command-and-control regulations.*

Blanke, R.H., L. Coldwell, T. Wiegele and R. Zilinskas. "Toward Better Education in Biopolitics." *Issues in Science and Technology* (Spring 1988): 51-53.

- *Discusses obstacles to bringing technology and the liberal arts together, including academic structures and traditions that make it unrewarding and difficult for university professors to teach outside their departments. The authors suggest that the discipline of political science, because of its focus on public policy, has a particular responsibility to educate students in science and its social implications, but political science may have become intellectually isolated from science and technology.*

Bolin, Bert. "Science and Policy Making." *Ambio* 23:1 (February 1994): 25-29.

- *Thoughts on the role of a scientist serving in the position of science advisor; the particular context is political responses to advances in our scientific understanding of climate change.*

Cardinal, E.A. "Risky Business: Communicating Risk for the Government." *Environmental Science and Technology* 25:12 (1991): 1982-1985.

- *A view of rationales used by various groups to assess environmental risk. Scientists see risk determination as a technical process whereas the public sees it as a personal decision.*

Chapman, P.M. "Environmental Quality Criteria: What Type Should We be Developing?" *Environmental Science and Technology* 25:8 (1991): 1353-1359.

Moore, D.R.J., et al. "Criteria or Guidelines?" *Environmental Science and Technology* 26:1 (1992): 7-8.

- *A wide-ranging and thought provoking essay on how to measure and safeguard environmental quality, and a rebuttal letter by a group of government scientists. Since all are Canadians, this provides an excellent overview of the issues involving environmental regulation in this country placed in an international context in a respected environmental journal.*

Clayson, A. "Global Environmental Research: Who's Doing What?" *Ambio* 19:5 (August 1990): 270-272.

- *A valuable guide to the significant international research efforts directed toward major environmental issues such as climate change, ozone depletion, acid precipitation and forest studies.*

Curran, M.A. "Broad-based Environmental Life Cycle Assessment." *Environmental Science and Technology* 27:3 (1993): 430-436.

- *A useful introduction to the concept of preventing pollution by analyzing the entire system around a particular process, activity or product.*

Doble, John and Amy Richardson. "You Don't Have to be a Rocket Scientist . . ." *Technology Review* (January 1992): 51-54.

- *The authors' research suggests that the lack of detailed scientific knowledge does not prevent most people from carefully assessing scientific issues if they are taught general concepts about science-based policy issues.*

Easterbrook, Gregg. "Everything You Know about the Environment is Wrong: A Liberal Sceptic's Guide to Earth Day." *The New Republic* (30 April 1990): 14-27.

- *A provocative article in which the author jabs at most of the popular environmental issues of the day. Although Easterbrook often exaggerates to make his points about misdirected efforts and fashionable alarmism, a main theme is that a "Chicken Little" backlash may develop where the public may stop listening when environmentalists issue warnings. While a number of the*

points may be overextended, the author does land some telling blows. Everyone should read this article, if only to acquire ammunition to provoke humourless "enviro" friends at parties.

"Environmental Survey of the States." *City and State* (13 July 1992): SG7.

- *A chart summarizing, on a state-by-state basis, American policies related to waste, water, air, land and energy.*

Foster, K.R., D.E. Bernstein and P.W. Huber, eds. *Phantom Risk: Scientific Inference and the Law*. Boston: MIT Press, 1993.

- *A good overview of the knowledge one needs to understand the claims of harm to human beings from a variety of industrial and natural chemicals.*

Grove, R.H. "Origins of Western Environmentalism." *Scientific American* (July 1992): 42-47.

- *In a review of 200 years of conservation development, the author concludes that states will act to prevent environmental degradation only when their economic interests are shown to be directly threatened. Philosophical ideas, science, indigenous knowledge and people and species are not enough to precipitate such decisions.*

Hartig, J.H., D.E. Rathke and D.J. Williams. "How Clean is Clean in Great Lakes Areas of Concern?" *Journal of Great Lakes Research* 16:1 (1990): 169-179.

- *An attempt by the International Joint Commission's Water Quality Board to define adequate water quality for areas of major pollution and the water uses they support. A good analysis of the complex social and scientific issues.*

Howe, Charles W. "An Evaluation of U.S. Air and Water Policies." *Environment* 33:7 (September 1991): 10-15, 34-36.

- *The title describes the content. The author concludes that present U.S. policies are expensive, inefficient, and contain little stimulus to prevent pollution.*

Hrudey, S.E. and S.J. Pollard. "The Challenge of Contaminated Sites: Remediation Approaches in North America." *Environmental Review* 1 (1993): 55-72.

- *A review of environmental science and public policy considerations relating to dealing with contaminated lands.*

Kimbrough, R.D. "Environmental Protection: Theory and Practice." *Environmental Science and Technology* 24:10 (1990): 1442-1445.

- *An important discussion of the need to incorporate the great explosion of knowledge in the fields of toxicology, environmental health and ecology into environmental laws and regulations designed to improve public health and environmental quality. While the discussion is oriented toward American regulatory agencies, the core of the analysis applies very much to regulation in Canada and Ontario.*

Lewis, H.W. *Technological Risk*. New York: Norton, 1990.

- *Probably the best book on risk assessment for the non-specialist. Objective and very readable.*

Maddox, John. "Defending Science Against Anti-science." *Nature* 368 (17 March 1994): 185.

- *The author warns that there is a need for concerted action against the forces of anti-science; simply ignoring the critics will not suffice to counter the phenomenon.*

Moghissi, A.A. "Political Environmentalism." *Environment International* 17 (1991): 395-396.

- *An interesting editorial essay which regrets the gradual splitting of the environmental movement into two distinct groups: scientific environmentalists who rely upon the best available science, and political environmentalists who depend upon politically-processed science as the basis for their arguments.*

Morgan, M.G. *et al.* "Communicating Risk to the Public: First Learn What People Know and Believe." *Environmental Science and Technology* 26:11 (1992): 2048-2055.

- *Discussion of how to develop balanced materials that provide lay audiences with the necessary information to make informed decisions about the risks they face.*

Parker, J. and C. Hope. "The State of the Environment: A Survey of Reports from Around the World." *Environment* 34:1 (January/February 1992): 29-30, 39-44.

- *This paper summarizes "State of the Environment Reports" prepared by international organizations and individual countries around the world. A good source of information and data sources.*

Parson, E.A., P.M. Haas and M.A. Levy. "A Summary of the Major Documents Signed at the Earth Summit and the Global Forum." *Environment* 34:8 (October 1992): 12-15, 34-36.

- *A useful compendium of material from the two conferences held in June 1992 in Rio de Janeiro.*

Russell, Christine. "What, Me Worry?" *American Health* (June 1990): 45-51.

- *An interesting discussion of how the public ranks 26 environmental health "risks" compared with how government experts categorize them. Includes a summary of the 15 greatest health risks which are responsible for nine out of ten deaths in the United States.*

Sparrow, Malcolm K. "From Data Warehouse to Information Craft Shop: The Changing Shape of Information Support for Environmental Protection." *Environment International* 18 (1992): 3-9.

- *Describes a major U.S. initiative to transform the style of information management within the environmental community.*

Tait, J. and L. Levidow. "Proactive and Reactive Approaches to Risk Regulation: The Case of Biotechnology." *Futures* (April 1992): 219-231.

- *Discussion of the nature and desirability of proactive approaches to risk regulation and their impact on industrial innovation.*

Tombouliau, P. "Regulating at the Edge." *Environmental Science and Technology* 23:9 (1989): 1041-1045.

- *Good discussions of risk assessment, risk management, and issues relating to how scientific findings can be used to meet society's need to reduce risk from chemicals.*

United States. Environmental Protection Agency. Office of Policy Analysis. *Unfinished Business: A Comparative Assessment of Environmental Problems*. Washington, DC: The Agency, February 1987.

- *A description of how EPA specialists rank environmental risks for regulatory policy development. Issues are considered from the health, ecological and social welfare risk viewpoints. An interesting exercise which may be of value to anyone involved in trying to establish environmental priorities.*

Weinstein, N.D. "Optimistic Biases About Personal Risks." *Science* 246 (8 December 1989): 1232-1233.

- *The public overestimates the harm caused by some problems, such as toxic waste, yet underestimates the number of people harmed by other hazards, such*

as asthma. Less familiar is the consistent, optimistic bias that exists concerning personal risks. When asked about their own chances, people claim that they are less likely to be affected than their peers.

Yankelovich, Daniel. "How Public Opinion Really Works." *Fortune* 126:7 (5 October 1992): 102-108.

- *The author suggests the public's thinking on issues progresses through seven predictable stages, and politicians and policy makers err in only looking at raw numbers.*

Rabies in Wildlife

(See Also: Ecology & Ecosystems; Natural History)

Rabies is a viral disease, largely affecting foxes and skunks, and which is almost always fatal to humans and other mammals if infected and not treated. A new strain of rabies, to which raccoons are very susceptible, is now approaching Ontario from the United States. Since raccoons are abundant in cities and likely to come into contact with humans, a significant effort should be made now to immunize the wild raccoon population and forestall a massive future cost for rabies treatments for the human population.

The following articles put these issues into perspective.

Frenia, M.L., S.M. Lafin and J.A. Barone. "Features and Treatment of Rabies." *Clinical Pharmacy* 11 (January 1992): 37-47.

Ontario. Ministries of Health, Agriculture and Food, and Natural Resources. Raccoon Rabies Task Force. *The Raccoon Strain of Rabies: Recommendations to Prevent its Becoming Established in Ontario*. Toronto: The Task Force, 14 February 1992.

Rosatte, Richard C., *et al.* "Rabies Control for Urban Foxes, Skunks and Raccoons." in *Proceedings of the 14th Vertebrate Pest Conference*. Edited by L.R. Davis and R.E. Marsh. Davis, CA: University of California, 1990: 160-167.

Toxic Chemicals

(See Also: Environmental Hypersensitivity, Hazardous Waste, Public Policy and Environmental Research)

General References

Beland, P. "Witness for the Prosecution: Scientific Studies on Beached Belugas are Strengthening the Case against Chemical Pollutants." *Nature Canada* (Fall 1988): 29-36.

- *Not a definitive scientific study but rather a poignant account of how marine mammals appear to be suffering serious effects due to contamination of their aquatic habitats by a variety of organic and inorganic chemicals. An example of a situation in which the precise toxicants or mechanisms may not yet be clear but where a serious impact is evident.*

Crone, H. *Chemicals and Society: A Guide to the New Chemical Age*. New York: Cambridge University Press, 1987.

- *A readable introduction to the major groups of chemicals and how they interact with humanity and the environment. A good introduction to the relative risks of environmental issues and other aspects of modern life.*

Kamrin, M. *Toxicology: A Primer on Toxicology Principles and Applications*. Chelsea, MI: Lewis Publishers, 1988.

- *An accessible overview of the ways in which toxic materials affect living things. Not overly technical; easily understood.*

Lewis, Richard J., Sr. *Carcinogenically Active Chemicals: A Reference Guide*. New York: Van Nostrand Reinhold, 1991.

- *Discusses identification and risk assessment of carcinogens and occupational exposures to chemicals, and lists confirmed, suspected and questionable carcinogens and their known effects.*

Environmental Toxicology

The following review articles are quite technical in parts, but they give sound overviews of many of the complex questions that are being addressed by ecologists and toxicologists studying chemicals and their potential implications. For those with a substantial interest in such issues, these papers should provide a good introduction to the literature and research.

- Ashbey, J. and R.S. Morrod. "Detection of Human Carcinogens." *Nature* 352 (18 July 1991): 185-186.
- Bascietto, J., D. Hinckley, J. Plafkin and M. Slimak. "Ecotoxicity and Ecological Risk Assessment: Regulatory Applications at EPA." *Environmental Science and Technology* 24:1 (1990): 10-15.
- Brown, S.L. "Harmonizing Chemical and Radiation Risk Management." *Environmental Science and Technology* 26:12 (1992): 2336-2338.
- *The author contrasts the differing frameworks for assessing hazards from chemicals and from ionizing radiation and explores the need for an improved and more consistent strategy for managing risks based upon harmonizing the two approaches.*
- Cairns, J. and D.I. Mount. "Aquatic Toxicology." *Environmental Science and Technology* 24:2 (1990): 154-161.
- Foran, J.A. "Toxic Substances in Surface Water." *Environmental Science and Technology* 24:5 (1990): 604-608.
- Harris, H.J., P. Sager, H.A. Regier and G.R. Francis. "Ecotoxicology and Ecosystem Integrity: The Great Lakes Examined." *Environmental Science and Technology* 24:5 (1990): 598-603.
- Hay, A. "How to Identify a Carcinogen." *Nature* 332 (28 April 1988): 782-783.
- Kocher, D.C. and F.O. Hoffman. "Regulating Environmental Carcinogens: Where Do We Draw the Line?" *Environmental Science and Technology* 25:12 (1991): 1986-1989.
- LaGrone, F.S. "Potential Community Exposure to Toxic Chemicals: Using Volatile Organics Measurements for Assessing Community Air Quality." *Environmental Science and Technology* 25:3 (1991): 366-368.
- Lioy, P.J. "Assessing Total Human Exposure to Contaminants." *Environmental Science and Technology* 24:7 (1990): 938-945.
- MacKay, D. and S. Peterson. "Evaluating the Multimedia Fate of Organic Chemicals: A Level III Fugacity Model." *Environmental Science and Technology* 25:3 (1991): 427-436.
- Shane, B.S. "Human Reproductive Hazards." *Environmental Science and Technology* 23:10 (1989): 1187-1195.
- Stevens, J.B. and D.L. Swackhamer. "Environmental Pollution: Multimedia Approach to Modelling Human Exposure." *Environmental Science and Technology* 23:10 (1989): 1180-1186.

Tosato, M.L., *et al.* "A New Strategy for Ranking Chemical Hazards: Framework and Application." *Environmental Science and Technology* 25:4 (1991): 695-702.

Types of Contaminants

The following references provide reviews of the environmental and human health implications of several major classes of environmental contaminants that tend to receive the bulk of media attention. Most consider acute and sublethal toxicity, including chronic exposure effects, genetic implications, environmental persistence and exposure pathways. These should serve as an introduction to the literature of toxic chemicals and the types of questions which must be answered to address the risks involved with exposures to them.

Amato, Ivan. "The Crusade Against Chlorine." *Science* 261 (9 July 1993): 152-154.

- *A balanced overview of the debate on the possible need for intensive regulation of chlorine and chlorinated compounds.*

Abelson, P.H. "Excessive Fear of PCBs." *Science* 253 (26 July 1991): 361.

Asplund, G. and A. Grimvall. "Organohalogens in Nature: More Widespread than Previously Assumed". *Environmental Science and Technology* 25:8 (1991): 1346-1350.

Canada. Department of Energy, Mines and Resources. *Lead in Canada*. Ottawa: The Department, 1986.

Culliton, B.J. "U.S. Government Orders New Look at Dioxin." *Nature* 352 (29 August 1991): 753.

Driscoll, C.T., *et al.* "The Mercury Cycle and Fish in the Adirondack Lakes." *Environmental Science and Technology* 28:3 (1994): 136A-143A.

- *Recent research on concentrations of natural and industrial mercury in fish tissues and factors which affect this accumulation.*

The Environmental Applications Group Limited. *The Environmental Toxicology of Polycyclic Aromatic Hydrocarbons (PAH or PNA)*. Prepared for Hazardous Contaminants Coordination Branch, Ontario Ministry of the Environment. Toronto: The Ministry, March 1990.

Giesy, J.P., J.P. Ludwig and D.E. Tillitt. "Deformities in Birds of the Great Lakes Region: Assigning Causality. *Environmental Science and Technology* 28:3 (1994): 128A-135A.

- *A review of the impacts of contaminants on Great Lakes birds.*

Hayes, W.J. and E.R. Lewis, eds. *Handbook of Pesticide Toxicology*. 3 vols. San Diego, CA: Academic Press, 1990.

- *A comprehensive reference describing the effects of over 250 insecticides, herbicides and fungicides on humans and animals. An authoritative and up-to-date treatment which also includes a good review of the general principles of toxicology.*

Mastroiacovo, P., et al. "Birth Defects in the Sevaso Area after TCDD Contamination." *Journal of the American Medical Association* 259:11 (18 March 1988): 1668-1672.

- *An accident in Sevaso, Italy in 1976 caused the largest public exposure to dioxin ever to occur. Although the data collected failed to demonstrate any increased risk of birth defects associated with the dioxin 2, 3, 7, 8 — TCDD, the number of exposed pregnancies was not large enough to detect a low and specific risk of increased birth defects.*

Nriagu, J.O. "Global Metal Pollution: Poisoning the Biosphere?" *Environment* 32:7 (September 1990): 7-11, 28-31.

_____ and J. Pacyna. "Quantitative Assessment of Worldwide Contamination of Air, Water and Soils with Trace Metals." *Nature* 333 (1988): 134-139.

- *Important surveys of the extent of metal pollution throughout the world along with discussions of health, economic and ecologic implications of present emission practices.*

Ontario. Ministry of the Environment, Hazardous Contaminants Coordination Branch. *Scientific Criteria Document for Standard Development: Polychlorinated Dibenzo-p-dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) (dioxins and furans)*. Toronto: The Ministry, 1986.

Ontario. Lead in Soil Committee. *Review and Recommendations on a Lead in Soil Guideline: Report*. Prepared by Hazardous Contaminants Coordination Branch, Ontario Ministry of the Environment. Toronto: The Ministry, May 1987.

Roberts, L. "E.P.A. Moves to Reassess the Risk of Dioxin." *Nature* 252 (17 May 1991): 911.

- Safe, S., ed. *Polychlorinated Biphenyls (PCBs): Mammalian and Environmental Toxicology*. Environmental Toxin Series, vol. I. Berlin: Springer-Verlag, 1987.
- Stokes, Pamela M., ed. *Pathways, Cycling and Transformation of Lead in the Environment*. Prepared for Environment Canada. Ottawa: Supply and Services Canada, 1986.
- Stone, Richard. "Swimming Against the PCB Tide." *Science* 255 (14 February 1992): 798-799.
- Trotter, D.M. *A Review of the Aquatic Effects of Metals*. Prepared for Water Resources Branch, Ontario Ministry of the Environment. Toronto: The Ministry, 1987.
- Tschirley, F.H. "Dioxin." *Scientific American* 254:2 (February 1986): 29-35.
- *An interesting account of the complexities of developing policy for a substance which is extremely toxic to some laboratory test species, but of questionable danger to other species, including humans.*

Water Resources

- Adams, William J., R. Kimerle and J. Barnett. "Sediment Quality and Aquatic Life Assessment." *Environmental Science and Technology* 26:10 (1992): 1864-1875.
- *A comprehensive review of issues related to contaminated sediments.*
- Apogee Research International Ltd. *The User Pay Approach to Stormwater Management and its Potential Applications in Ontario*. Ref. # 240-CIW. Burlington, ON: Canada Centre for Inland Waters, Environment Canada, 29 March 1991.
- *An evaluation of ways of meeting the costs of storm water management by means of "user pay" strategies.*
- Bishop, J.N. "Groundwater Protection." *Hazardous Materials Management* (June 1991): 14, 17-18.
- *A concise overview of ground water resources, uses and management in Ontario.*

Canadian Council of Ministers of the Environment. *Canadian Water Quality Guidelines*. Ottawa: Environment Canada, Environmental Conservation Directorate, Sustainability Branch, 1991.

- *This looseleaf report summarizes basic scientific information about the effects of water quality parameters on categories of water use in order to assess water quality issues and concerns and to establish water quality objectives. Periodic updates.*

Chahine, M.T. "The Hydrological Cycle and its Influence on Climate." *Nature* 359 (1 October 1992): 373-380.

- *A concise and readable overview of the atmospheric, terrestrial and oceanic aspects of the cycling of water.*

Cherry, John A. "Groundwater Protection: The Lack of Government Action in Canada." *Hazardous Materials Management* 1:2 (November/December 1989): 18-22.

- *A respected hydrogeologist examines ground water contamination problems and research, and compares ground water protection policy and regulation in Ontario with other jurisdictions.*

_____, and J. Harman. "Organic Chemicals in Canadian Groundwater." *Hazardous Materials Management* (October 1994): 47-49.

- *An overview of contamination of ground water.*

City of Toronto. Department of Public Health. *The Quality of Drinking Water in Toronto: A Review of Tap Water, Bottled Water and Water Treated by a Point-of-Use Device*. Toronto: The Department, 1990.

- *A comprehensive review of the quality of Toronto's public water supply, as well as that of commercial bottled waters and the effectiveness of home water purification devices. An excellent review of the factors to be considered in assessing the safety of water supplies makes this reference also useful to those living outside Toronto.*

Dynesius, M. and C. Nilsson. "Fragmentation and Flow Regulation of River Systems in the Northern Third of the World." *Science* 266 (4 November 1994): 753-762.

- *A major study of northern watersheds in Canada and abroad.*

Hartig, J.H., D. Rathke and D. Williams. "How Clean is Clean in Great Lakes Areas of Concern? Report from the 1988 IAGLR Symposium." *Journal of Great Lakes Research* 16:1 (1990): 169-179.

- *An interesting attempt to define "how clean is clean?" for 14 water use impairment types at 42 polluted areas in the Great Lakes. Emphasis is placed on defining and measuring biological effects.*

Healy, M. and R. Wallace, eds. *Canadian Aquatic Resources*. Canadian Bulletin of Fisheries and Aquatic Sciences, no. 215. Ottawa: Department of Fisheries and Oceans, 1987.

- *An excellent overview of scientific, economic and social aspects of water resources and their use.*

"How to Save Water." *Consumer Reports* 55:7 (July 1990): 465-473.

- *A popular article on how to reduce water use in the home.*

International Joint Commission. *Bibliography of Reports*. Ottawa: The Commission, 1994.

_____. *Seventh Biennial Report on Great Lakes Water Quality*. Ottawa: The Commission, 1994.

Karvinen, W.O. and M.L. McAllister. *Rising to the Surface: Emerging Groundwater Trends in Canada*. Kingston, ON: Queens University; Centre for Resource Studies, 1994.

- *A recent review of federal and provincial trends in legislation and policy development related to ground water resources.*

Leopold, Luna B. *A View of the River*. Cambridge, MA: Harvard University Press, 1994.

- *A readable and enjoyable account by the leading river geomorphologist of this century. Many insights into river form and action.*

de Loë, Robert. "The Institutional Pattern for Water Quality Management in Ontario." *Canadian Water Resources Journal* 16:1 (1991): 23-43.

Ludwig, J.P., et al. "A Comparison of Water Quality Criteria for the Great Lakes Based on Human and Wildlife Health." *Journal of Great Lakes Research* 19:4 (1993): 789-807.

Maddaus, William O. "The Effectiveness of Residential Water Conservation Measures." *Journal of the American Water Works Association* 79:3 (March 1987): 52-58.

- *Results of surveys and research into new and retrofitted water saving devices and their effectiveness.*

Maryland, Department of Natural Resources. *Shore Erosion Guidelines for Waterfront Property Owners*. Annapolis, MD: The Department, n.d.

- *One of the best handbooks of its type. A good introduction to shoreline processes and erosion protection with excellent illustrations.*

Ontario. Ministry of Environment and Energy. *Water Management: Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment*. Toronto: The Ministry, 1984.

- *Known popularly as the "blue book," it lists goals for quality and quantity management of ground and surface waters. As well, it lists Provincial Water Quality Objectives which are a set of narrative and numerical criteria designed for the protection of aquatic life, recreational values, and agricultural uses. The Ministry also has a checklist of new and revised objectives which accompany the blue book.*

Ontario. Ministry of Environment and Energy. *Ontario's Water Quality Objective Development Process*. Toronto: The Ministry, March 1992.

- *Provincial water managers explain how they develop standards for water quality. Recommended for toxicologists and insomniacs.*

Ontario. Ministry of Natural Resources. *A Review of the Conservation Authorities Program*. Toronto: The Ministry, December 1987.

- *This report by an inter-ministerial steering committee chaired by R. Burgar examined a broad range of issues related to the mandate, membership, funding and possible amalgamation of Ontario's Conservation Authorities. While the economy has changed and the review process has progressed since this report was released, many of the issues are still to be resolved and there has as yet been little opportunity for public involvement in the future direction of these organizations.*

Page, G.W., ed. *Planning for Groundwater Protection*. Orlando, FL: Academic Press, 1987

- *With potential seepage of leachates from waste disposal sites being so topical, and since many public water supplies originate from wells, the need to know the basics of ground water management is increasing. This book is more readable than most, and provides a good overview of basic hydrology,*

drinking water and health, technology for removing contaminants and requirements for local planning for ground water protection. A number of case studies are included.

Satterlund, D.R. *Wildland Watershed Management*. New York: Ronald Press, 1972.

Walesh, S.G. *Urban Surface Water Management*. New York: Wiley, 1989.

Whipple, W., et al. eds. *Stormwater Management in Urbanizing Areas*. Englewood Cliffs, NJ: Prentice-Hall, 1983.

- *Three sound basic references on water management in undeveloped and urban environments.*

Saull, M. "Nitrates in Soil and Water." *New Scientist* (15 September 1990): 1-4 (Special Section - Inside Science).

- *A review of nitrate contamination of ground water and its implications to agriculture and human health.*

Schiechtl, Hugo. *Bioengineering for Land Reclamation and Conservation*. Edmonton: University of Alberta Press, 1980.

- *An enormously important book for anyone involved with erosion prevention, landscape remediation and water resources. Detailed information on using plants, shrubs and trees for improving and protecting waterways, slopes and other landscape elements. This is worth seeking out!*

Smith, Graham. "Ontario's Water Policy: From Vision to Plan Implementation." *Canadian Water Resources Journal* 15:2 (1990): 172-175.

- *Federal and provincial water managers discuss the need for a water policy for Ontario.*

Tobin, R.S., G.C. Wood and M.J. Giddings. "Development of Drinking Water Guidelines for Public Health Protection." *Canadian Water Resources Journal* 16:4 (1991): 433-437.

- *Federal water managers explain how they develop standards for drinking water. Warning! The abstract is almost as long as the paper.*

Tourbier, J.T. and R. Westmacott. *Water Resources Protection Technology: A Handbook of Measures to Protect Water Resources in Land Development*. Washington, DC: The Urban Land Institute, 1981.

- *A practical and comprehensive survey of on-site strategies for environmental protection and mitigation. Useful sketches, photographs, case studies.*

Vickers, Amy. "Water-Use Efficiency Standards for Plumbing Fixtures: Benefits of National Legislation." *Journal of the American Water Works Association* 82:5 (May 1990): 51-54.

- *A review of performance of water-saving fixtures and estimated benefits of legislation requiring their use.*

Warren, C.E. *Biology and Water Pollution Control*. Philadelphia: Saunders, 1971.

- *Not a pollution control handbook, but a unique discussion of biological and ecological approaches to water pollution problems. An important resource for anyone interested in water quality management.*

Zebra Mussels/Exotic Species' Introductions

Dermott, R. and M. Munawar. "Invasion of Lake Erie Offshore Sediments by *Dreissena*, and its Ecological Implications." *Canadian Journal of Fisheries and Aquatic Sciences* 50 (1993): 2298-2304.

- *Account of the establishment of the zebra mussel and its cousin, the "quagga" mussel in Lake Erie.*

Locke, A., et al. "Ballast Water Exchange as a Means of Controlling Dispersal of Freshwater Organisms by Ship." *Canadian Journal of Fisheries and Aquatic Sciences* 50 (1993): 2086-2093.

International Joint Commission and the Great Lakes Fisheries Commission. *Exotic Species and the Shipping Industry: The Great Lakes — St. Lawrence Ecosystem at Risk*. A Special Report to the Governments of the United States and Canada. Windsor, ON: The International Joint Commission, September 1990.

- *A good summary of issues, research requirements and regulatory initiatives related to invasions of freshwater systems by the zebra mussel and other non-native aquatic organisms.*

Mackie, G.L., et al. *The Zebra Mussel. (Dreissena polymorpha): A Synthesis of European Experiences and a Preview for North America*. Prepared for Great Lakes Section, Water Resources Branch, Ontario Ministry of the Environment. Toronto: The Section, July 1989.

- *A good, comprehensive summary of available information.*

Mellina, E. and J.B. Rasmussen. "Patterns in the Distribution and Abundance of Zebra Mussel (*Dreissena polymorpha*) in Rivers and Lakes in Relation to Substrate and Other Physiochemical Factors." *Canadian Journal of Fisheries and Aquatic Sciences* 51 (1994): 1024-1036.

Mills, E.L., *et al.* "Colonization, Ecology, and Population Structure of the "Quagga" mussel (Bivalva: Dreissenidae) in the Lower Great Lakes." *Canadian Journal of Fisheries and Aquatic Sciences* 50 (1993): 2305-2314.

_____. "Exotic Species in the Great Lakes: A History of Biotic Crises and Anthropogenic Introductions." *Journal of Great Lakes Research* 19:1 (1993): 1-54.

- *A major literature review covering a broad range of plant and animal introductions.*

Ontario. Legislative Assembly. Standing Committee on Resources Development. *Report on Exotic Species in Ontario*. Toronto: The Committee, 1991.

- *The Resources Development Committee invited leading Canadian and American scientists, naturalists, outdoors groups, utility and industrial managers and government resource managers to present information on zebra mussels, purple loosestrife, and other imported plants and animals. The Committee's report provides a valuable summary of information and proposed solutions to problems caused by exotic species. Copies are available from Committees Branch of the Ontario Legislature.*

PERIODICALS

There are many journals and magazines devoted to environmental topics and issues.

A few of the most up-to-date and reliable are listed below. All are available at the Legislative Library.

- *Environmental Review*
- *Environment Policy & Law*
- *Eco/Log Week*

Three newsletters devoted to regulatory news, current research and other topical features. Emphasizing Ontario and Canada.

- *Environmental Science and Technology*

Once a "hard-core" research journal, it has now added a front section geared to the non-specialist; excellent review articles on important environmental topics and a good current events summary.

- *Nature*
- *Science*

British and American journals devoted to a broad range of scientific research. While many technical articles would be of little interest to the general reader, these periodicals do provide extensive current coverage of major environmental issues such as global warming and ozone layer depletion. They now also have summaries of the most interesting and significant scientific papers which are prepared by scientific journalists in a more accessible style.

- *New Scientist*

A British magazine with excellent treatment of newsworthy current environmental research and policy issues. Good international coverage and both interesting and readable in presentation.

- *Forum For Applied Research and Public Policy*

This journal tends to have excellent review articles on energy, environment and technology issues from a broad range of viewpoints. Emphasis is on the political, regulatory, economic and public policy implications of such issues, rather than on science.

APPENDIX

Environmental Titles from the Legislative Research Service

- Anderson, Anne and Jerry Richmond. *Preservation of Agricultural Land*. Current Issue Paper No. 118. Toronto: Legislative Research Service, Legislative Library, 1991.
- Luski, Lorraine. *The Environmental Assessment Process in Ontario: Debates and Directions*. Current Issue Paper No. 100. Toronto: Legislative Research Service, Legislative Library, 1990.
- _____. *Ontario's First Timber Management Class Environmental Assessment*. Current Issue Paper No. 104. Toronto: Legislative Research Service, Legislative Library, 1990.
- McNaught, Andrew. *Citizen Participation in the Protection of the Environment: Recent Proposals for Legislative Change*. Current Issue Paper No. 101. Toronto: Legislative Research Service, Legislative Library, 1990.
- _____. *The Hagersville Tire Fire: A Legal Overview*. Current Issue Paper No. 98. Toronto: Legislative Research Service, Legislative Library, 1990.
- Neufeld, David. *Acid Rain in Ontario*. Current Issue Paper No. 44. Toronto: Legislative Research Service, Legislative Library, 1986.
- _____. *Groundwater in Ontario: The Management and Protection of Underground Sources of Drinking Water*. Current Issue Paper No. 58. Toronto: Legislative Research Service, Legislative Library, 1987.
- _____. *Hazardous Waste Management in Ontario: Policies, Initiatives and Issues*. Current Issue Paper No. 51. Toronto: Legislative Research Service, Legislative Library, 1986.
- Nishi, Victor. *Greenhouse Effect*. Current Issue Paper No. 98. Toronto: Legislative Research Service, Legislative Library, 1990.
- _____. *Ozone Depletion*. Current Issue Paper No. 92. Toronto: Legislative Research Service, Legislative Library, 1989.
- Pond, David. *The Draft Report of the Sewell Commission*. Current Issue Paper No. 137. Toronto: Legislative Research Service, Legislative Library, 1993.
- Richmond, Jerry. *Municipal Waste Recycling*. Current Issue Paper No. 79. Toronto: Legislative Research Service, Legislative Library, 1988.
- Yeager, Lewis. *Chernobyl, Three-Mile Island and Beyond: Lessons for Ontario?* Current Issue Paper No. 117. Toronto: Legislative Research Service, Legislative Library, 1991.
- _____. *Composting Municipal Solid Waste*. Current Issue Paper No. 86. Toronto: Legislative Research Service, Legislative Library, 1989.
- _____. *Conservation Authorities in Ontario*. Current Issue Paper No. 115. Toronto: Legislative Research Service, Legislative Library, 1991.

- _____. *Degradable Plastics, Packaging and Waste Management*. Current Issue Paper No. 80. Toronto: Legislative Research Service, Legislative Library, 1988.
- _____. *Energy-From-Waste Incineration*. Current Issue Paper No. 77. Toronto: Legislative Research Service, Legislative Library, 1988.
- _____. *Management of Municipal, Hazardous and Radioactive Wastes: An Environmental Overview*. Current Issue Paper No. 109. Toronto: Legislative Research Service, Legislative Library, 1990.
- _____. *An Overview of Municipal Solid Waste Management Issues in Ontario*. Current Issue Paper No. 76. Toronto: Legislative Research Service, Legislative Library, 1988.
- _____. *Storm Water Management*. Current Issue Paper No. 82. Toronto: Legislative Research Service, Legislative Library, 1988.



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